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ABSTRACT

Six papers from the 1988 CAUSE conference's Track VIII, Academic Computing Strategy, are presented. They include: "Achieving Institution-Wide Computer Fluency: A Five-Year Retrospective" (Paul J. Plourde); "A Methodology and a Policy for Building and Implementing a Strategic Computer Plan" (Frank B. Thomas); "Aligning Planning, Policy Development, and Information Services Delivery in a Shared Governance Environment" (Marshall Edward Drummond and Steven R. Neiheisel); "The Changing Role of the CIO: Establishing the Infrastructure Was the Easy Part" (Carol A. Barone); "'Partnerships' Are the Focus of This Information Systems Plan" (Douglas E. Hurley); and "Strategic Planning for Technology at the Wharton School: Facilitating Change" (William J. Brennan, Michael F. Eleey, Thomson M. Kuhn, Drusie Sheldon, and Shirley Slotnik). (SM)

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Information Technology: Making It All Fit

Proceedings of the 1988 CAUSE National Conference

TRACK VIII: Academic Computing Strategy

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Track VIII
Academic Computing Strategy

Coordinator:
Dan Updegrove
EDUCOM

Many colleges and universities are increasing investments in computing for instruction and research, but few have planning processes that link such computing to institutional strategy. Are such processes necessary? Moreover, does more or better computing lead to fulfillment of institutional—as opposed to technical—goals? Papers in this track address such questions.

Douglas E. Hurley, University of Kentucky

Paul J. Plourde, Bentley College

ACHIEVING INSTITUTION-WIDE COMPUTER FLUENCY: A FIVE-YEAR RETROSPECTIVE

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Bentley College
Waltham, Mass.

The papers reviews the efforts of Bentley College over a five-year period (1983-1988) to integrate the use of computers into virtually every phase of academic life. It chronicles the noteworthy events that were planned and executed that had as their main objective the movement of the student and faculty population beyond computer literacy and to achieve computer fluency.

Some of the events that are reviewed include developing and implementing:

training seminars for faculty,

strategies for integrating the computer into the curriculum,

a strategy for equipping all students with microcomputers and associated software,

a campus-wide data and tele-communications network, and an on-line library system.

The paper concludes with an assessment of the successes and failures of the various strategies employed to accomplish our academic computing goals.

In 1977, Bentley College started what has since become a long involvement with the use of computers to support its instructional program, as well as, automate the administrative and academic support mechanisms of the college. As an institution primarily oriented to students (8,000 FTE) who major in business related disciplines, the college first reacted to the burgeoning presence of computers by a creating a new department. This department Computer Information Systems (CIS) was established to teach service courses for other academic departments and to teach specialized courses to students whom they hoped to attract to major in this discipline.

By 1983, the strategy of introducing a major in Computer Information Systems and the related strategy of first teaching service courses and then beginning to integrate the use of the computer in the other disciplines had been more fruitful than we could have imagined. By this time, we had attracted nearly 1,000 majors and the twenty-five full-time faculty members were teaching over one-hundred sections of CIS courses.

Another strategy was to teach computing skills to our own faculty by offering computing seminars. These were introduced by Academic Computer Services to introduce non-CIS faculty to the fundamentals of computing and the prospects of using computers in their respective disciplines. 1 The carrot that was used to attract faculty to these seminars was that they would be assigned a computer or terminal at the completion of the training period. The result was that over one-hundred of the one-hundred and seventy (170) faculty at that time participated. A few faculty went beyond these offerings and audited specialized CIS courses and still others enrolled as students in the Masters program in CIS. These efforts, resulted in a modest number of non-CIS courses approximately thirty (30) that required the student to complete some computer related assignment.

Up to this point in time, the primary hardware support was several hundred time-sharing terminals attached first to a large DEC10 system and subsequently several PRIME systems. This was supplemented by a micro laboratory equipped with forty-one (41) APPLEII+ microcomputers. Of more importance is the fact students paid a lab fee for the use of these facilities that was based on the extent of use that was anticipated in a given course. When the course was completed, the student did not have access to computing facilities unless they registered for another course that required the use of the computer or they took the initiative to voluntarily pay a computer lab fee. It is not surprising that this has been categorized as

> "COURSE-ORIENTED COMPUTING .... The main characteristic of this phase of computer utilization was that course assignments dictated the use of the computer. Students were spoon-fed assignments in a particular course and they were not necessarily encouraged to utilize the system(s) after the course was completed." 2

This brief review of the pre-1983 computing era sets the stage for a discussion of the topic of this paper which is the Five-Year period after 1983 when Bentley sought to achieve institution-wide computer fluency.

The objective of this period was to proceed beyond computer literacy, which we defined as "an awareness and knowledge of the hardware and software as well as directed use," 3 to achieve computer fluency which involves the understanding of how to utilize the hardware and software to solve business problems and developing experience doing just that.

The view at Bentley was that

> "in an information society, individuals will not be force-fed in the business environment as they were during Phase I. Our hypothesis is that the user determines when a computer is needed to solve a business problem." 4

In order to accomplish this redefined objective, we literally had to change most everything we were presently doing as regards computing at the college. This ranged from how instruction was provided to how students gained access to computing facilities and included developing a program for increased faculty involvement in terms of increasing the integration of the use of computers across the curriculum and extended to revamping the organizational structure of computer services. The first step towards affirming that we were aspiring to this new goal was the publication by the Dean of the Undergraduate College in 1983 of a set of ambitious academic computing goals as follows:

> "1. All Bentley College Bachelor of Science and Master degree degree candidates will be computer literate.
>
> 2. The Computer Informations Systems Department will offer programs in information systems and computer science that are nationally recognized for the expertise of their graduates.
>
> 3. Computer applications will be integrated across the curriculum in appropriate disciplines and courses so that individuals in majors from departments other than CIS will be at the forefront of computer applications in their fields and will be sought by employers for this characteristic.
>
> 4. The college will offer credit and non-credit computer programs as appropriate for such audiences as executives, high school teachers, children, small business people and others seeking a level of computer knowledge.

5. All Bentley faculty will be computer literate and be able to employ the computer in their courses, where appropriate, within four years.

6. Relevant faculty research will be supported on campus or through time-sharing off campus.

7. The college will support a computing utility that includes mainframes as well as various microcomputers with stand-alone and on-line mainframe access capability.

8. The college will provide for the sale of microcomputers to faculty, staff, and students." 5

These were indeed lofty objectives and the strategies that were used will be reviewed below, as well, as an appraisal of the relative measure of success and/or failure of these various strategies.

First of all, we had to examine the organization that existed to support academic computing. In 1983, the Director of the Computer Center (who controlled the hardware and software resources) reported to the Vice President for Administration and the Director of Academic Computing reported to the Dean of the Undergraduate College. There was an advisory committee on computing comprised of members of the Board of Trustees sprinkled with a few select external members but the real decisions were made by the Board of Trustees Committee on Business and Finance who acted on resource allocation requests to acquire hardware and software as well as fund new positions.

Organizationally, the first action was to bring the Director of Academic Computing under the Director of Computer Services but, almost simultaneously, the Board of Trustees approved the creation of a new position of Vice President for Information Services which would carry with it the creation of a Board of Trustees Committee on Information Services. This action was significant in that discussions on planning for and the use of information technology would have its own forum at the board level with chairman of this committee serving on the Executive Committee of the Board of Trustees. Previously, such discussions were minor items on a long agenda before the Committee on Business and Finance.

In practice, the recommendations of the Information Services Committee do come before the Business and Finance Committee when funds are required but the added benefit has been that the Committee on Academic Affairs has been brought into the deliberations when computing issues impinge on academic policy which is often the case. In fact, there have been a number of joint meetings of the Board of Trustees Committees on Academic Affairs and Information Services.

The next area of major concern was how we would transition from the course-oriented computing environment described above to a student-oriented computing environment where

> "the computer is merely a another version of the "MIT slide-rule"and that, if they are properly trained, the students will decide in a judicious manner when the computer should be used to solve a problem in whatever course." 6

The impact of this approach on the faculty is significant since, if successful, it would allow the faculty to assume that the student had knowledge of a variety of software tools and approaches as well as hardware. Thus, when a problem presents itself, the student will determine whether this problem-solving exercise is suited to computer use and seek out appropriate hardware and software with which they are familiar or seek help from faculty or student cohorts.

In order to achieve this new environment, we planned to expose freshmen to six courses in which they would make extensive use of computer. This was begun in 1984 with all freshmen were required to take two courses in Computer Information Systems and a select group of one-hundred and fifteen freshmen participated in a pilot test in which they were required to take a two-course sequence in accounting and a two-course sequence in english and made extensive use of the computer.

The students in this pilot study were equipped with portable/ personal computers and software which included BASIC, LOTUS, a word processing and an integrated accounting package. The other students, who were only taking the two course CIS sequence, had to use the computer labs for completion of class assignments. Thus, it is not surprising that the pilot study sought to determine whether a portable computer used by students, wherever and whenever they pleased, would be a better vehicle to implement student-oriented learning than a desk-top computer used by students in a campus computer laboratory.

Analysis of a pre-test and post-test instrument resulted in a positive reading of the impact of students having computers and in 1985-1986 all freshmen were equipped with portable computers and in the academic year 1986-1987 all freshmen and sophomores were equipped with similar computers.

The attitudes of the pilot group towards computers and computing as a tool indicated that experimental group students had positive attitudes toward computers and computing at the beginning of the experiment and the post-test revealed that their attitudes became even more positive toward:

...computers improving the quality of life.
...word processing being of use while at college.
...their power over the computer.
...computers as easier and less complicated.
...writing as more exciting. 7

The positive findings on attitudes toward computers and computing reinforced the goal of issuing portable computers for all students. The non-negative effect on writing along with the singular result that writing was perceived as more exciting also reinforced the model and method for delivering the model.

During 1984 and 1985, we intensified the faculty computer workshops which ranged from specialized half-day and multi-day sessions for faculty that had already achieved basic computer literacy to a full week of training during the summer and in January for new and old faculty who needed the basics. We also altered the courses that the we anticipated freshmen would make use of computers extensively by adding a quantitative analysis course and the an economics course to replace one of the accounting courses that was moved to the sophomore year.

In preparation for the pilot test and the full implementation of the required computer program, we had an active implementation committee of faculty and a few administrators who planned course content, the timing of the introduction of material as well as more mundane and essential matters as the logistics of distributing hardware and software and introducing the students to the system before the first of classes. The particulars concerning these activities were reported at CAUSE 85 and appear in the proceedings.**

The lack of such a committee proved to be a problem in subsequent years in terms of course coordination although the distribution of the equipment became a routine success.

As we moved onto our second year of requiring micros, we continued to expose students extensively in the freshmen but the development of courses in the sophomore year lagged behind our expectations. It is important to note at this juncture that our strategy from the beginning was to train faculty and start with course development in the freshman year and then the sophomore year and finally penetrate the upper division courses. To be sure, there were selected non-CIS faculty who had the inclination and/or the ability to develop courseware or simply utilize existing software in upper-division courses. There was a very practical reason for this bottom-up strategy since we hoped to justify the further expansion of the required computer policy in subsequent years and we needed to insure that students would find a need for the equipment.

Throughout this program of requiring freshmen and sophomores to rent computers, we continued to administer the pre and post test instruments that we had used in the pilot test. After evaluating the cost and benefits the college decided not to expand the program beyond the freshmen and sophomore years and, in 1987, juniors, and seniors were merely encouraged to acquire a computer while the freshmen and sophomores were still required to rent or buy a computer.

The implementation of this policy resulted in the sale of 141 (15%) computers to Juniors in the fall of 1987 and only a handful of Seniors chose to acquire a system. It is important to note that only the pilot test group amongst these Seniors had access to a computer during their Freshmen or Sophomore years. Of those students who majored in Computer Information Systems, 30 percent acquired computers as Juniors and 70 percent did not. Only 20 percent of these same CIS majors acquired computers in 1988 as Seniors.

The situation improved somewhat in 1988 when 25 percent of the Junior class chose to rent or buy a system but 57.1% of CIS majors chose this option. A review of the reasons identified by upper division students for acquiring or not acquiring a system is noted below and they reflect the very practical nature of the Bentley student especially when one considers that over 75% of them work extensively to support their own college education. Thus, it is not surprising that cost, need, and convenience were of primary concern.

REASONS FOR ACQUIRING		REASONS FOR NOT ACQUIRING	
Needed in a course	27.5%	Cost too high	41.3%
Convenience	27.5%	Have micro access	17.4%
Cost/Benefit	20.7%	Not needed	13.0%
Word Processing	13.7%	Obsolescence	10.8%
Dislike labs	5.9%	Labs are better	6.9%
Other	8.7%	Poor quality pc	4.3%
		Other	7.3%

Utilization of computers in courses has not increases as we had expected and integration of computer use across the curriculum has not proceeded as swiftly as we had anticipated. Of some import is an apparent rejection of the notion that once trained students will decide for themselves to solve business problems with computer tools that they have been trained to use. There is little evidence

of any significant use of computers beyond the original exposure to word processing, spreadsheeting and some statistical analysis unless it is course-directed. In fact, students do not use computers significantly more as Juniors and Seniors. To the contrary, use diminishes in the senior year.

While the preceding could be viewed as a failure of the original program, in a very real sense it could also be viewed as a reaffirmation of our original policy that students should decide wherever and whenever they should use a computer. In reality, the extent of use is masked somewhat by the elimination of computer fees associated with courses. Instead students, who have not rented or purchased a computer, now pay a computer lab fee. Thus, we no longer keep a rigorous count of courses and registrations in these courses since it does not computer fee revenue.

This lack of expansion in the number of courses was not the only or most major problem that resulted in subsequent years however. Of more import was a major new thrust by the institution that had the effect of invalidating the academic computing goals that were advanced in 1983. This event was the new commitment on the part of the institution to emphasize research on a co-equal basis with teaching. The impact of this change was that faculty no longer felt compelled to the previous high priority on faculty computer fluency and the integration of the computer in courses across the curriculum.

Paralleling these activities on the academic front were five other projects that had a major impact on moving the institution towards the level of fluency that we sought to achieve. These were:

1. the acquisition of an integrated MIS package and the subsequent decision to modify the package,

2. the development of a campus-wide local area network which was reported at the CAUSE National Conference in 1985, 8

3. the installation of a digital telephone system,

4. the acquisition of a library package, and

5. the extensive use of micros in administration and in virtually every facet of college life.

With all of this activity, it is important to consider where we are today and where we might direct our attention to in the future. The following is a list of the more notable points of fact concerning computing at Bentley.

--Computers are mandatory in the freshmen and sophomore years.

--Computers are optional in the junior and senior years

--students do not use computers significantly more in the upper division

--students have not embraced our concept of having computers at their disposal to solve business problems

--integration of the use of computers across the curriculum is fairly stagnant although task forces are addressing this

--the LAN has not been extended to student rooms

--the administration uses an MIS package but they are looking to the SQL software generation

--their is extensive use of micros in all facets of administration (academic as well as administrative)

--the library package has been in use for three years but there is not extensive remote access

--the digital telephone system installed three years ago has not been used extensively for data communications

As far as looking at our future, most of the following will likely occur:

--Mandatory computers for ^Freshmen and Sophomores will continue for a few more years

--There will be a slow increase in course utilization

--there will be some renewed interest in mainframe computing

--there will be a major increase in student demand for network access to PC's, the library, records and external sources

--there will be increased distribution of the administrative computing workload

--there will be continued expansion in the use of micros of various types in all facets of college life with a gradual demand for connectivity

--the LAN will be extended to student rooms but the LAN vs PBX issue will not be resolved quickly.

FOOTNOTES

1 For the contents of these training sessions, see the Proceedings of the ACM Conference on Computer Science Education, D.Anderson and H. Zbyzinski "Faculty Training Seminars," Philadelphia,PA, 1984 pp. 210-219.

2 James Adair, Dennis M. Anderson and Paul J. Plourde, "Transitioning from Computer Literacy to Computer Fluency," Proceedings of the International Busineess Schools Computer Users Group (IBSCUG), University of Iowa, July 29,1986 pp.29-40.

3 IBID., p.31.

4 IBId., p.32.

5 IBID., p.39.

6 James Adair, Dennis M. Anderson and Paul J. Plourde, "An Experiment in Student Oriented Computing," in Computers and Business Schools: Progress on Integration, Green, R., Malhotra, N. and Parsons, C. Georgia Institute of Technology: Atlanta,GA, July 29, 1985, pp. 76-97.

7 James Adair, Dennis M. Anderson and Paul J. Plourde, "Organizing and Implementing the Freshmen Computer Program," in Proceedings of the National Educational Computing Conference (NECC86), W. Ryan (ed.), ICCE:Eugene,OR, pp.107 -111.

8 Plourde, Paul J. "Organizing to Suuport the Masses: A Unified Approach," in Proceedings of CAUSE85. Planning and Managing the Odyssey, CAUSE:Boulder,CO, December 1985, pp.343-353.

9 Plourde, Paul J. "Developing A Campus-Wide LAN: We're Half -Way There," in Proceedings of CAUSE85, Planning and Managing the Odyssey, CAUSE:Boulder,CO, December 1985, pp.211-221.

A METHODOLOGY AND A POLICY FOR BUILDING AND IMPLEMENTING A STRATEGIC COMPUTER PLAN

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ABSTRACT

The University of Akron's computing was under the control of the computing center from 1964 through 1980. All planning and implementation of computing hardware and software was controlled by the Computer Center. In 1980, with the implementation of Personal Computers, this centralized control was no longer the accepted norm. Starting in 1984, the state supplemented the University's computing dollars to the tune of $3 million for each biannum over a six year period. This additional expenditure of $9 million had a stimulating effect over the distribution of computing across campus. It pointed to the need for a strategic computing plan for the entire campus.

In December of 1985, the President requested that I put together a computer planning committee and complete the plan within three months. The outcome of this request produced a Computer Planning and Policy Committee and several subcommittees to do the actual planning. This paper will discuss the approach on how we view computing as it fits into the strategic plan. A policy for controlling the acquisition of all computer software and hardware will be discussed. This policy was developed to make certain the plan is implemented with little or no duplication.

A METHODOLOGY AND A POLICY FOR BUILDING AND IMPLEMENTING A STRATEGIC COMPUTER PLAN

Introduction

The University of Akron is an urban university with seven colleges; Fine Arts, Education, Arts and Sciences, Engineering, Business, Nursing, and a Community and Technical two year college. The University has been fortunate in that the central computing resources during the 1960's and 70's were adequately supported and staffed. We do not have many departmental computers although there are two academic mini's outside the computer center. That is to say the demand for departmental computing, due to the lack of a good service in the central center, has not led to the decentralization of computer resources. However, in 1980 when personal computers began to appear, the situation changed. Budget requests for personal computers were submitted from every department. The central computer center was no longer the single source for this valuable resource.

From 1980 to 1984 most of the budget requests were not being funded by the central administration. There was not enough monies to satisfy all the demands.

At the same time, the Directors of Computing from all the Ohio universities were working with the Board of Regents to obtain additional monies earmarked for academic computing. This additional money was proposed to supplement the universities' operating funds and allow us to purchase additional academic software and hardware--especially personal computers.

These additional funds were approved by the legislation in 1984 and were allocated on a formula based on the need for work stations. The University of Akron's allocation was $3 million for each biannum, starting and ending in 1988 for a total of $9 million. The first $3 million was allocated to academic departments. Within one year, these monies were spent for personal computers and replacement equipment.

During the 1984-85 academic year, the administration was overwhelmed with requests for computer equipment. It was evident that to spend $3 million dollars in an effective manner, we needed an overall plan for computing. This paper will discuss an approach to building a strategic plan and the policy that supports the implementation.

How do things happen?

Things happen because you make them happen and finding the time to make things happen is the problem. On one hand there is never enough time to plan, yet, on the other hand, there will never be enough time available for doing more things until you plan. Doctors Merrill Douglass and Larry Baker commented in their Time Management Program Guide, "The more you do of what you are doing, the more you get of what you got." Planning does not start

with strategic planning; it starts with daily planning of your activities to meet your objectives. Once you master planning at all stages, it becomes a habit. It is with this type of habit that I relate to you the focus on strategic planning for computing at the University of Akron.

Before 1980, the planning for computing was the total responsibility of the Computer Center. During the 1970's this was not all bad as batch processing tended to centralize computing. Today, with personal computers and local area networks, the ability to distribute computing has the advantage of allowing the user to control his own destiny and not be at the total mercy of one organization.

Why a Strategic Computing Plan?

When computing was centralized, the entire request for computer resources came from the computer center. In one way, this was good for the administration in that computing resources were controlled. As personal computers came into the picture and every department and college was asking for computing dollars, the administration had to have a plan to control the request for computing resources. A strategic plan would help the institution to also meet its goals for better quality in its efforts to upgrade instruction as well as its research capacity.

A third reason to support such a plan was to make certain that each and every faculty member and student had access to the resources they required to do their job.

A Need for a Strategy

It was with these goals in mind that the President, Dr. William Muse, in January of 1986, asked the Computer Center Director to put together a strategic plan and requested that I help form and recommend members for a computer planning committee. Since the scope of the job was too big for one committee, I recommended we have a Computer Planning and Policy Committee and that sub-committees be formed to do the actual planning.

A Computer Planning and Policy Committee was recommended to the President with the objective to define the scope of the plan and review the plan for funding. This committee consisted of the Provost, Vice President of Business and Finance, Director of Computer Services, Assistant Director of Computing for Administrative Systems, one dean, three faculty members and the university Controller.

The Computer Planning and Policy Committee met and decided that one, the University's view of computing was consistent with the state of the art, and secondly, that every faculty member and student should be able to access the necessary resources he required through the appropriate network.

Keeping in mind that there is no longer a centralized view of computing and that the University wants to increase its quality and quantity of computing for instruction and research, I formulated an

approach to develop a strategy. I took the view that computing exists at various levels and in special categories. For example, there is administrative computing; hence, we need a strategic plan in that category. We also support a Computer Based Education Center and we have a definite need for a plan here. Office automation is another special area and we wanted to make sure that we built a plan to increase our productivity in this area.

For academic's, computing exists at various levels and is distributed. We broke academic computing into three areas--large mainframes, graphics (a special area) and minis and micros. The concept here is that we want any student or faculty member to be able to access any mainframe through any network. Since networking is so important to our plan, the final area to be considered was networking.

The strategy was to break computing into various areas of specialization and three levels for academic computing through a hierarchical network of micros, minis and large mainframes.

My suggestion to the Computer Planning and Policy Committee was to form seven subcommittees to do the actual planning. This recommendation was accepted. The special areas for planning were:

1. Administrative computing
2. Large mainframe academic computing
3. Academic minis and micros
4. Graphics, both academic and administrative
5. Computer Based Education, Instructional
6. Office automation for all departments, Deans, V.P.'s, etc.
7. Networking

Planning subcommittees were formed from appropriate members of the faculty, Faculty Committee for Computer Utilization, and administrators. Each subcommittee had five members including myself as an ex officio member. The members of these committees were the key players in their area of expertise from the faculty and staff. The President appointed each member after reviewing my recommendations. The subcommittees had two months to formulate the results of their studies into a detailed plan. The role of each subcommittee was to interview faculty and staff and compile the computing needs for their portion of the plan. Most of the subcommittees set up specific times and dates to meet with their constituents and many used surveys to reach those individuals that could not attend the subcommittee meetings. All the subcommittees completed their interviews and consolidated their data into a report within a week of the scheduled completion date which was March 1, 1986. It was then my responsibility to consolidate their data and complete a final draft of the plan by April 1, 1986.

Developing the Plan

The final plan was developed along the same lines as the subcommittees with six separate sections. Each recommendation was itemized with an estimated cost. The Computer Planning and Policy Committee reviewed the plan and made selected cuts where they felt it was over estimated in quantity or duplication. The total cost of the plan was estimated at $13,124,200 and cut to $12,067,500.

Large Academic Mainframe

This committee recommended we purchase an IBM 3090-200 and an IBM 4381 to replace our IBM 30330 and the IBM 4361. The budget cost was approximately $6,387,000, we spent $6,450,000. This included the purchase of six IBM 3380 disk drives. The recommendation was adopted by the Computer Planning and Policy Committee and the equipment was acquired through a lease purchase in December of 1986.

Minis and Micros

There were 16 recommendations for a total cost of $1,605,000; approximately $355,000 has been spent to date. Several of the recommendations have not been implemented due to the fact that clusters of micros were to go into new buildings not yet completed. One of the recommendations had to do with one additional minicomputer for support of graphics.

Graphics

There were nine recommendations for a total cost of $1,975,500. To date, we have spent $430,000 on both academic and administrative graphics. There were recommendations for three dedicated graphic centers in Civil Engineering, Art and Construction Technology.

Administrative

The administrative plan was a continuation of our previous administrative plan with a total cost for additional software and hardware at $200,000. To date, we have spent $160,000. Most of the monies were to be spent in support of telephone registration, which was installed in October of 1987.

Computer Based Education

This portion of the plan recommended we do nothing and that no more money should be spend in updating software and hardware.

Office Automation

The subcommittee recommended that we install Sperry's Office System with a separate minicomputer network of Sperry 5000-50's and 5000-85's to support the President, Vice President, academic and administrative departments. Total cost for this effort was estimated at $1,400,000. To date, we have spent $400,000.

Networking

A general summary stated that we develop our own data network. We had recently purchased our own Dimension 2000 voice switch and access the existing cables on campus. The approximate budget was $100,000/year for fiber and twisted pair cables to be connected between buildings. To date, we have spend $350,000 that includes a Proteon backbone network between the Computer Center, Engineering, Computer Science and the Library. This Network allows us to reach the Supercomputer Center in Columbus, Ohio.

Summary of Expenditures to Date

	Budget	Expenditures
Large Academic Mainframe	6,387,000	6,450,000
Minis and Micros	1,605,000	355,000
Graphics	1,975,500	430,000
Administrative	200,000	160,000
Computer Based Education	0	0
Office Automation	1,400,000	400,000
Network	500,000	350,000
TOTAL	12,067,500	7,795,000

Updating the Plan

The plan was updated once in 1987 and the subcommittees were reinstated to review the plan and make the necessary changes. Today we are reviewing the graphics proposal and preparing a budget that will increase our expenditure in this area. We expect to complete the second review of the entire plan by June of 1989. Each subcommittee will be recalled to review the accomplishments and make the necessary request for changes.

Policy on Control of Hardware Acquisition

The Provost requested that a policy be written and approved by the Faculty Committee on Computer Utilization (FCCU) to govern the acquisition of all computer equipment. There already exists policies on computer and terminal acquisition and a new policy was written to govern the purchase of personal computers and local area networks in line with the five year plan. The basic policy states that the Director of Computer Services approves all the purchases of computer equipment.

Working with the deans and departments, the Director of Computer Services provided assistance in the selection of hardware and software to meet their needs. The policy on microcomputers also states that the University support seven specific vendors and maintenance is performed in-house. The policy was approved by the FCCU and the Provost and is in effect today.

Conclusion

Although the expenditures have involved approximately $8,000,000 in three years, we are anticipating adding three large personal computer clusters to two new buildings that will not be completed until 1990. One additional cluster will be added to the dormitories in 1989. Although we may fall short of money to complete the plan by 1991, we have taken very important steps in setting our objectives and goals.

I can tell you that should we spend 75 percent or better on the estimated budget, we will have made a major expenditure. The University is very close to being at the state of the art in computing.

ALIGNING PLANNING, POLICY DEVELOPMENT AND INFORMATION SERVICES DELIVERY IN A SHARED GOVERNANCE ENVIRONMENT

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ABSTRACT

With the arrival of a new president in July 1987, Eastern Washington University began an intensive examination and evaluation of existing organizational structures and planning processes for the entire university with particular emphasis on computer services, both academic and administrative. In early 1988 major recommendations were presented and approved with respect to a number of areas. These included the definition and establishment of a university-wide planning/budgeting process, the creation of a University Computing Policy Review Committee, and the creation of a single University Information Resources division that includes a Chief Information Officer reporting directly to the president.

This paper briefly reviews the background problems and issues which led to these changes, presents detailed information on the processes and structures that have been established, and discusses the first year of implementation. Finally, the outlook for the future is explored.

I. BACKGROUND

Planning/policy making Processes Prior to July, 1987

Eastern Washington University had operated on a highly decentralized model for the ten years prior to 1987. The University was divided into three major areas of responsibility including Academic Affairs, Business and Finance, and Extended Programs. Each division was headed by a vice president reporting directly to the president. A fourth division was established in 1984 when a Vice President for Student Services was appointed and these services were centralized.

There were no formal entities charged with inter-divisional planning, and budgeting was viewed as individual to each organizational unit. An annual "roll-over" system of budgeting had been used at the division level and within departments in divisions. These roll-over amounts were occasionally modified to accommodate a general funding level change, or a new program which demanded new resources. There was no methodology in place for the periodic review of various programs to determine alignment with university mission or goals, and university direction suffered from the lack of consensus and widespread knowledge of university goals and directions.

The responsibility for computing services was divided between Business and Finance for administrative computing and Academic Affairs for academic computing support. Administrative computing was further divided between a computer center in physical plant which supported energy management and accounting services for the university's auxiliary enterprises, and the main administrative computing center. Administrative computing was fairly well provided for, with a fiscal year 1986 budget of over $3 million. Academic computing was less well provided for, with a fiscal year 1986 budget of $398,000. There was a total lack of university-wide planning for computer services, which was evidenced by empire building and the refusal to share resources between the academic and administrative factions.

Problem Statement

Many years of operating the university under the decentralized model led to a repetitive style of budget allocation within which budget bases were simply "rolled over" year after year with relatively minor adjustments applied except for reallocations necessary to fund new programs. As university role and mission changed over the years the contrast of mission to program mix as supported by the roll-over budgets became further and further misaligned. Further, the lack of sunset reviews in some cases caused the continuance of institutes and other special programs long after the purpose for which they had been designed had ceased to exist. The roll-over system also brought about inequities in the distribution of travel and goods and service budget allocations between units. This is most noticeable when a unit diminishes in staff due to attrition and non-replacement, but the budgets for travel and goods and services roll-over in tact because they are not tied to units of productivity.

The history of divided camps within the university's computing organizations resulted in a severe imbalance of spending between administrative and academic computing support activities. During fiscal year 1986 this gap had grown to the

difference between $55 per FTE for academic computing support and $313 per FTE for administrative computing support. The lack of computing plans and objectives made it difficult to determine whether or not funds were being properly expended, but a comparison of the funding levels requested from the Legislature against the actual spending showed that academic computing was spending approximately 23% of the funds requested and administrative computing was spending 110% of the requested funding. This meant that although the Legislature had not fully funded the requests for computing the institution was deciding to spend a disproportionate amount of the funding received on administrative pursuits.

Years of spending imbalances had left the faculty feeling disenfranchised with regard to computing on campus, and the student population poorly served in terms of access to university-provided computer services. Students using the computer facilities were charged annual fees averaging over $60 per student, yet as previously mentioned the spending per FTE was only $55. In addition to these problems, there were general difficulties with the lack of hardware and network standards that had come about due to the lack of overall planning, and problems with staffing patterns and the equal provision of support services to administrators in all divisions of the university.

II. THE PROCESS OF CHANGE

July 1987 - January 1988

Dr. Alexander Schilt was hired in the Spring of 1987 as University President, and planned to take office on August 1. One of the new president's first interests was to assess the planning/budgeting processes that existed at the university, which he did prior to officially taking charge. A consulting team lead by Dr. Thomas West, Associate Vice Chancellor - California State University System, and Dr. George Huxel, Vice Chancellor of the University Of Houston, came to campus to study planning, budgeting, and computer services. Among their recommendations for highest priority implementation were:

To Develop a university-wide planning/budgeting process that coincided with the State's biennial budget system.

To make a significant expenditure to provide improved student access to university computing

To create a single organization for delivery of all information services, including computing, telecommunications, printing and publications, and possibly the university library

To appoint a senior executive in charge of all university information resources reporting directly to the president

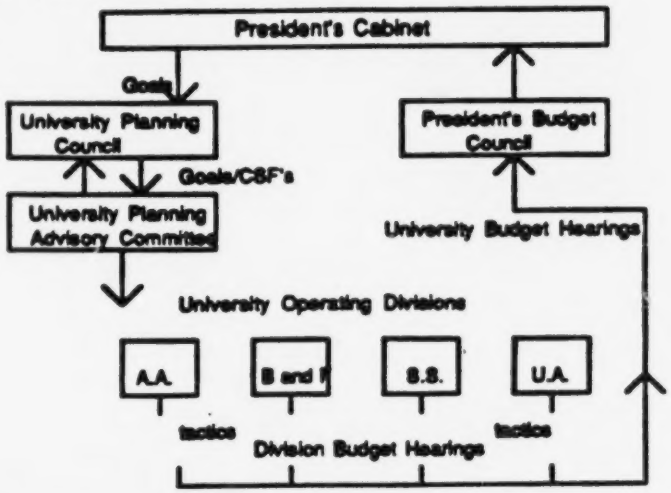
To establish a university-wide governance body for the formation and recommendation of computing plans and policies

The president accepted all of the recommendations of the consultant's, and formed a President's Select Committee to plan for the implementation of the recommendations. The university-wide computing governance group was established in January, 1988, and the University Informations Resources

reorganization was completed by March, 1988. The university-wide planning/budgeting process is just now getting under way.

Eastern's Direction and Model - University-wide Planning/Budgeting

There have been two layers of planning structure devised, one to accommodate strategic planning, the other to accommodate tactical planning. Input to guide the strategic planning process comes primarily from the University Role and Mission Statement, recent accreditation reports for the university and for several schools/colleges; a document created under the auspices of the Board of Trustees called "EWU 2000", and a report from a recent program review of all academic programs in the institution. Specific goal statements derived from these documents serve as the primary input for the planning/budgeting process. The organizational structure of the planning/budgeting process in as follows:



CSF = Critical Success Factor

The budgeting process will be composed of a combination of two components. The first component is a basic service level budget that is formula driven. Because the institution is funded by the State in accordance with a contract enrollment the formula component of the budget is enrollment driven. The budget includes only those ingredients that are deemed "absolutely" necessary to providing the basic services needed to generate the contract enrollment. Items such as institutes, faculty release time, enhanced systems, and other non-essential parts of the institution are part of the second budget component which is goal driven. As shown in the planning/budgeting organization above, once the goals and accompanying critical success factors are determined the organizational units take these and build budget requests that are supportive of the goals and critical success factors. These budget requests are subjected to two levels of hearing, one at the division level, and finally at the university level. It is the final combination of the two budgets (one formula driven and one goal driven) that forms the fiscal year operating budget.

Information Resources Governance - Trends in Higher Education

The organizational structure related to computing/information resources in higher education has undergone tremendous changes in the past 30 years. With the roots of computing in Computer Science Departments and business areas of the University much of the early attention focused on the combined versus separate issue with numerous studies and debates occurring. The current state of affairs is (as

noted in the 1980 and 1985 CAUSE Profiles) "in any given year a number of institutions are reorganizing the management of computing. At any point in time several combined installations are being reorganized into separate and several separate are being combined. Since there are good examples of both separate and combined organizations, it can no longer be said that any one organizational structure is better than another". However, as the capabilities of microcomputers continue to grow and the distribution of processing progresses to end users with more and more powerful tools, the traditional combined versus separate debate may no longer be appropriate.

Two emerging questions pertain to the reporting level of the person(s) responsible for Information Resources as well as their scope of responsibilities. As both academic and administrative computing have become more pervasive, the level of reporting for the individuals responsible for those tasks has been raised proportionally. The 1980 CAUSE Profile indicates that approximately 75% of those responsible for computing reported directly to a Vice President. This increased by 6% in the 1985 CAUSE Profile.

The second question, as noted by Gene Sharon in 1987, pertains to the scope of responsibilities for many of the "computer czars" on campus. Sharon notes that a 1987 study of 85 institutions identified Chief Information Officers, generally at the Assistant or Associate Vice President level, having comprehensive responsibility for academic and administrative computing as well as telecommunications. A recent edition of Information Resource Management predicts that by the 21st century the "CIO will be an integral part of the management team and will report at the same level as the Chief Operating Officer (COO) and Chief Financial Officer, and will report to the Chief Executive Officer (CEO)."

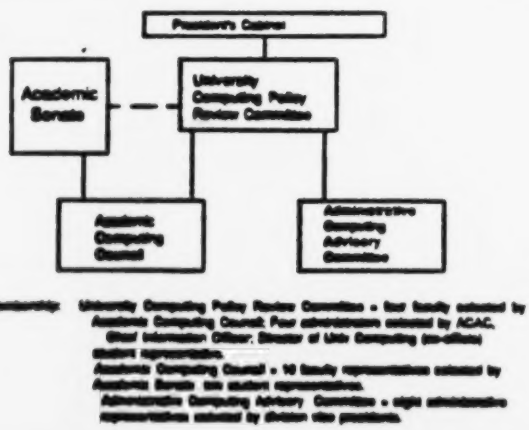
University-wide Computing Governance

A university-wide computing governance group called the "University Computing Policy Review Committee," constituted as shown below, was recommended by the consultants and approved by the Academic Senate and the President's Cabinet in the Fall of 1987. The primary charges for this group include:

Recommendations for resource allocations for all information resources

Recommendations for policies regarding the use and management of information resources

Recommendations regarding staff allocations and priorities for information resources departments



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The UCPRC serves as a recommending body to the Chief Information Officer, who in turn sits on the President's Cabinet. Recommendations requiring Cabinet level approval or Academic Senate approval are carried to those bodies by the Chief Information Officer. Tasks that require action by one of the two computing subcommittees (academic and administrative computing) are coordinated with the UCPRC by the chairs of the subcommittees, who also sit on the UCPRC. An example of such a task is the policy statement describing the types of academic computing labs that will be established on campus (fully open, class labs, etc.) and the way in which those labs will be managed, staffed, and budgeted. This policy statement will be generated by the Academic Computing Council and taken to the Academic Senate by the Chair of that Council. After the Council and Senate are satisfied with the policy statement it will be taken to the UCPRC for acceptance. If changes are required the nature of the changes will be indicated to the Academic Computing Council, and the process will repeat until the policy is acceptable to the UCPRC. Because this policy will contain recommendations about budget bases the final recommendation will go to the President's Cabinet.

The university-wide planning process and the planning for computing futures which is done by the UCPRC must be complimentary. Of primary concern to the divisions when developing their goal based budget requests is that they perform careful requirements analyses, and accurately predict the resource requirements that are required by each budget request initiative. The UCPRC must then take all of the budget requests that involve information resources, and access the impact of these requests on the hardware, software, and staff resources of the university. In addition to putting together all of the division budget requests that involve computing, the UCPRC is charged with envisioning economies and efficiencies (making multiple uses of a single product, etc.) that may be realized through purchasing, staffing, or equipment usage innovations. Once the UCPRC has reviewed all of the information resources components of the goal based division budgets the recommendations of the group will be passed on to the budget hearings via the Chief Information Officer. Any resource allocations that involve the provision of computing or other information resources will result in the funding being placed into the Information Resources Division budget.

III. OUTCOMES

Institutional Strategic Planning

Accomplishments

The major accomplishment in the area of institutional strategic planning is the existence of the planning structure itself which held its first meeting in early November. In just over one year, President Schilt has put into place a detailed planning model as earlier described which includes the University Planning Council, the President's Budget Council, and the University Planning Advisory Council. On a project of this magnitude and scope, the impact and influence of institutional strategic planning is generally long range and requires what can be referred to as a "full cycle" before results can clearly be seen and evaluated.

Problems

As in any new venture, particularly one as comprehensive as the intended University planning process is, there are a number of traditional problems that can be anticipated. These range from the comfort of status quo; the trust of the

constituents groups; the need for clear, consistent and concise communication to, as well as from, the constituent groups. Finally, the patience of the University community is needed in permitting the process to go "full cycle" and produce results. While these do not represent unique problems or challenges for Eastern Washington University, they do represent the currently anticipated ones.

In addition to establishing a new planning process, the President has also in the past year assembled a nearly complete new team of senior administrators with only one of four senior administrators remaining from the the previous administration. Given the new Vice Presidents' need for familiarization and assimilation possible problems may be anticipated. The hope, however, is that the coincidence of a new planning process and a new senior administrative team can provide the opportunity, potential and impetus for progress. While the pace of that progress may be slowed due to the "newness" of the senior administrators, the possibility of success is excellent.

Future

With the planning process and nearly all of the key personnel in place, the future of institutional strategic planning appears very positive at Eastern Washington University. The state of Washington is currently entering its biennial legislative session with requests for the 1989/90 fiscal years being considered. The planning process as it begins will form the basis for allocating these funds. It will also begin long term planning to project University goals through the next three biennia. The initial "full cycle" of University planning will effect the biennial budgeting process for the 1991/92 biennium. A review process will be incorporated to roll the planning activity forward to retain a minimum seven-year long range plan.

University-wide Planning for Information Resources

Accomplishments

The University Computing Policy Review Committee represents the primary arm within the overall University planning structure for Information Resources planning and policy making. This group serves in an advisory capacity to the Chief Information Officer and is supported by two user committees - the Academic Computing Council and the Administrative Computing Advising Committee. Given the time line within which this structure was established, the most pressing issue was the development of plans and the submittal of materials associated with the 1989-90 biennial budget process. In addition to planning for the coming biennium, the user committees have focused on the initial organizational issues associated with their responsibilities and the allocation of existing resources in the current fiscal year. Significant progress has been made in all of the above areas as noted in the Implementation of Plans and Policies.

Problems

This structure represents the initial attempt at Eastern Washington University to strategically plan for both academic and administrative computing within a single organizational structure. While every effort has been made to minimize the traditional academic versus administrative issue; in reality, the interest, needs, and perspective of the representatives of these areas will vary greatly. One of the great

challenges is to adequately address the diverse needs of these groups within this structure.

One unresolved problem is the relationship of the University budgeting process and the Information Resources planning and policy process. The existing committee structure represents a somewhat convoluted process when related to the budgeting. Specifically, unit representatives in the computing planning and policy process are not in the same structure and alignment as the budget preparation process. This represents one of the major issues to resolve in the coming year.

An additional problem encountered in establishing Information Resource policy and planning is the absence of a long range strategic plan. Much of the efforts of the current committee structure as noted has been short term in nature and/or related to current issues and existing resources. The initiation and on-going planning process should greatly assist in resolving this problem and providing direction for the future.

Finally, the institution has recently expanded the number of major administrative systems as well as academic computing access. The procedures and structure for user input into the Academic Computing Council and the Administrative Computing Advising Committee should also be addressed in the coming year.

Future

With nearly one full year of activity completed, the initiation and operational aspects of the committees appear to be progressing well. A number of major projects and activities have been successfully completed through the existing committee structure. While some amount of functional "fine tuning" remains, the overriding need is for the University planning process to become functional and for that process to provide direction. With a long range strategic planning process for the institution, it appears reasonable that the structure established for Information Resources planning and policies is capable of developing plans and policies at the appropriate level.

Implementation of Plans and Policies

Accomplishments

As noted earlier the major foci in planning for the past year has been the preparation of materials for the biennial budgeting process, the allocation of existing resources, and the ever present organizational issues associated with a new committee structure. Regarding the biennial process, a planning retreat with representatives of the University community as well as the committee structure was held in early March for the purpose of establishing overall University goals for the next biennium. Four major priorities emerged from that retreat including:

1. Academic and administrative workstations
2. Campus networking
3. Library automation and expansion
4. "Other" University projects

The initial two priorities, (workstations and network), were assigned to small task force groups to develop general material for inclusion in the budget process. The library expansion project was to be considered by the senior administration. Finally, the "other" project category was referred to the administrative and academic computing committees for development.

General plans were developed for networks and workstations and included in the planning process for the University in developing its biennial budget. One of the major accomplishments of the past year has been a commitment to expand and upgrade the library capabilities at Eastern Washington University in a joint cooperative venture with Washington State University. Detailed implementation of this agreement is currently underway. The two committees addressed the "other" aspect of the biennial process projects. Much of the committees' planning and detailed activity that has occurred has related to this objective. The current activity of the committees is focused on developing priorities among the projects in this category and prioritizing activities among the workstation, network, and other project categories.

Both the academic and administrative computing committees also addressed the allocation of existing resources. Specifically, the Academic Computing Council dealt with the distribution of $378,000 for equipment allocated from the previous fiscal year as well as approving $175,000 of incentive grants for faculty members. Based on these two allocations together with other growth through colleges and departments, the number of academic workstations increased by approximately 43% between June 1987 and September 1988.

Allocating additional access to the administrative systems was a major task for the Administrative Computing Advisory Committee. An extensive review and priority process was established and additional access was provided to a number of administrative offices, all of which were functional by late October of the current year.

Problems

One of the major problems associated with implementation is the ever familiar limited resources and staff issues. Conceding that one might reasonably guess that sufficient resources and staff will never come to pass, a significant amount of progress has been made. As computing access for academia has expanded dramatically in the past year and the administration has implemented new systems (including Information Associate's Alumni Development System and Purchasing module) the need for networking for all users has become more and more apparent.

Another problem noted which appears to have been addressed was the lack of committee functionality over the Summer months. As a committee that now deals comprehensively with Information Resources, the availability of faculty in Summer becomes a more pressing issue, particularly, in the area of preparation of plans and policies.

Future

The implementation of the university-wide computing planning process provides the promise that the committees will have both direction and substance with which to deal. The implementation task of the committees in the coming year include prioritizing University wide requests for the biennium, final recommending action

once funding levels are determined, projects associated with long and short range planning process, and the development of a detail network plan for the institution. In addition, the initial task force recommendations which established the committee structure call for the committee to review and establish a permanent structure for the management and functioning of Information Resources. The process of establishing a permanent structure, prioritizing plans, and distributing funds for the coming biennium are goals which given the progress and accomplishments within the past year appear to be feasible.

Goals for the 1990'S

It is highly unlikely that the identified needs of the 1989-90 biennium will receive full funding and implementation. Therefore, many of the goals that have been established for the next biennium will continue into the early 1990's. Furthermore, as noted in the strategic planning section above, the most visible results of the newly established planning process will occur in the first full cycle of that process which will be the 1991-1992 biennium. Finally given the traditional and necessary implementation time lines generally associated with Information Resources growth, many of the needs which are met with funding in the next two biennia (through 1992) will be in implementation phases well into the 90's.

The general goals of the 1990's are then fairly simple and straight forward. They include:

1. **A stable and on-going planning process which includes a minimum of a seven-year long range plan as well as biennial review processes to insure currency to that planning process.**

2. **An organizational structure for Information Resources planning that serves to incorporate the strategic policies and plans of the institution to Information Resources as well as address the needs and interests of the varying constituent groups throughout the University.**

Among the specific goals for Information Resources at Eastern Washington University in the 1990's are:

1. **A comprehensive and capable telecommunication network affording academicians and administrators adequate access to the hardware, software, and staff needed to carry out their duties.**

2. **Expanded access and an expanded role of academic computing with appropriate incentive and corresponding resources to increase the classroom use.of computers throughout the curriculum.**

3. **A comprehensive and integrated administrative system which can support and assist in the efficient and effective use of University resources.**

The existence of a comprehensive planning process, the establishment of an appropriate organizational structure for Information Resources, the functioning of the committees and the commitment of the staff supporting all of the above should contribute and serve Eastern Washington University well in the coming decade.

The Changing Role of the CIO: Establishing the InfraStructure Was the Easy Part

Presented at
CAUSE88

Carole A. Barone
Vice President for Information Systems and Computing
Syracuse University

THE CHANGING ROLE OF THE CIO: ESTABLISHING THE INFRASTRUCTURE WAS THE EASY PART

The days of the swashbuckling technological impresario are waning. Fiscal worries have now forced administrations to think about priorities and the risks associated with distorting them by placing too much emphasis on the amassing of technology. Computing has come under scrutiny because of concern over spiraling investments for capital equipment, staff, space, and operations (maintenance, software, supplies, utilities). Consequently, the focus of the Chief Information Officer's (CIO) role is shifting, from procurement and deployment, to communication and integration.

In the past, owing to naïveté regarding the potential impact of technology on traditional intra-institutional relationships, or being intimidated by the technology, some central administrations consigned their strategic planning responsibilities to the CIO. The CIO provided leadership as the institution positioned itself with respect to computational technology. However, the speed of acquisition and the boldness of choice of technology have strategic implications that reach beyond the computational milieu.

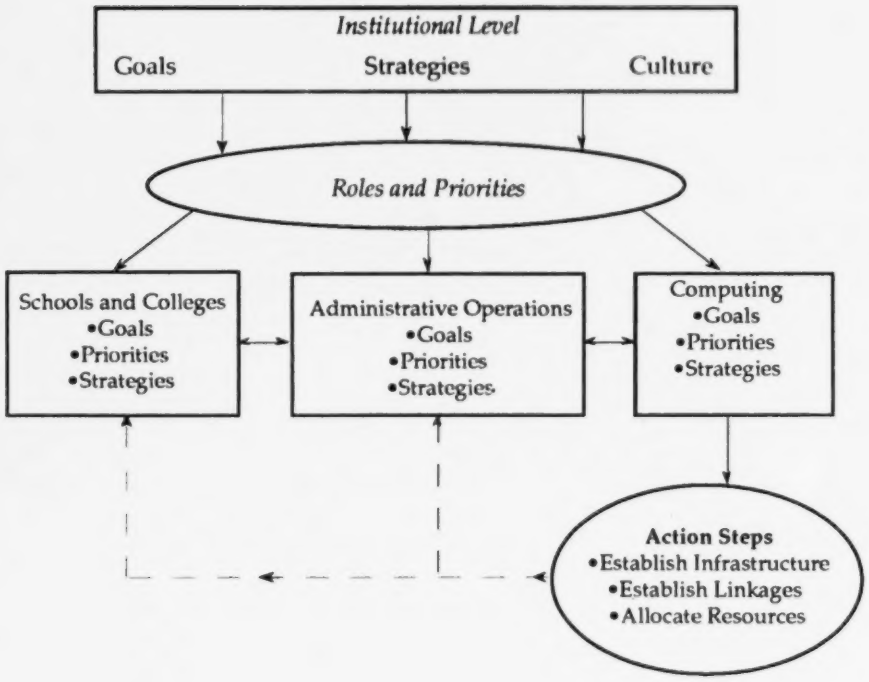
Some administrations have begun to assess the likelihood of the consequent technological environment's conforming to the institution's priority structure and cultural balance. Such anxieties are manifested in demands for evaluation and accountability, efforts to make direct linkages to academic and administrative goals, the emphasis on formal plans, and the mobility of CIO's. The time has come to refine and redefine the role of the CIO in relation to the composition, culture, and mission of the institution. Failure to engage in this form of introspection will lead to an unhappy mismatch between CIO and institution: a mismatch that has already occurred in more than a few instances.

A New Look at the Planning Process

Many institutions have by now set in motion plans that will lead to the establishment and maintenance of a solid infrastructure of computational technology and services. There has been a good deal of sorting and categorizing of equipment, much discussion of the components of computing infrastructure and its financing, but less of equitable deployment strategies and still less of prescriptions for making the linkage between computing and institutional goals. In retrospect, perhaps the most valuable outcome of the initial planning efforts has been the articulation of the strategic relationships, depicted in Figure I, that determine the role of computing (and, thus, of the CIO) within the institution.

Figure 1

Strategic Relationships



At Syracuse University those strategic relationships arise in the following form:

Institutional Goals:

- To be judged as the most improved and most rapidly improving independent institution in the AAU.
- To have our academic programs judged the most improved and most rapidly improving among independent institutions in the AAU.
- To maintain our comparative advantage and relative position in our administrative systems.
- To maintain the financial position of the University while financing the activities necessary to achieve these goals.[1]

Role of Computing: The shape of the computing environment will be a major factor in projecting the University to the next tier of academic excellence. The University aspires to provide high quality computing services, as needed, throughout its teaching and research programs while seeking opportunities to play a leading role in selected areas.[2]

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[1] Excerpted from Syracuse University Goals 1985-1990.

[2] Chancellor Melvin A. Eggers, Charge to the Academic Computing Planning Committee, 23 September 1985, Syracuse University, Syracuse, New York

Goal of Computing: To create a computing environment that strengthens the University's instructional and research programs...For computing to become as integral to instruction and learning as the library.[3]

Computing Strategy:

(1) Establish the infrastructure.
(2) "Make it all fit."

Another outcome of this initial planning exercise has been the definition of the role of the CIO and of the institution's expectations of that office. *EDUTECH* made the crucial distinctions in a two part series, appearing in its June and July 1988 issues, categorizing institutions and the roles of their CIO's into three groups: those that view technology as: (1) a strategic resource, (2) an aid in day-to day operations, (3) a source of confusion. The CIO (or equivalent) will be expected to function differently depending on the institution's sense of the importance of technology in achieving its mission as: (1) an information strategist, (2) custodian of machines and data, (3) technology problem solver.[4]

When implementing the initial plan, designed to create the computational environment, in an institution that has designated computing as a strategic resource and, thus, the CIO as an information strategist, the leadership role of the CIO is a charismatic one: strategic and decisive, visionary, change oriented risk taker, and entrepreneurial.[5] During this "broad sweep" phase many factors operate to lead a CIO to feel like the "Rambo" of the machine room. It is exciting to wheel and deal and quite easy for the ego to get caught up in that process, particularly because computing often becomes the focal point within the institution.

The vendors loved us (at least some of them did). All one needed was some money, good negotiating skills, and a set of convictions about the inherent value of technology.

"Rambo"-type CIO's tend to be a peripatetic group, perhaps because they lose interest in the leadership role once the titillation of the infrastructure establishment period evaporates. The very characteristics that served so well in the acquisition phase must now be sublimated. Patience, cultivation, diplomacy, persistence are the essential qualities of the CIO who will lead the institution into the next phase of planning and execution.

Driven by the escalating costs of computing, institutions are entering a transitional planning stage in which they strive to connect expenditures for computational resources to tangible academic or administrative outcomes. Figure II shows the framework for making strategic linkages within and among the various planning environments: institutional, computational, academic and

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[3] Syracuse University, Report of the Academic Computing Planning Committee, May 1986, p. 5.

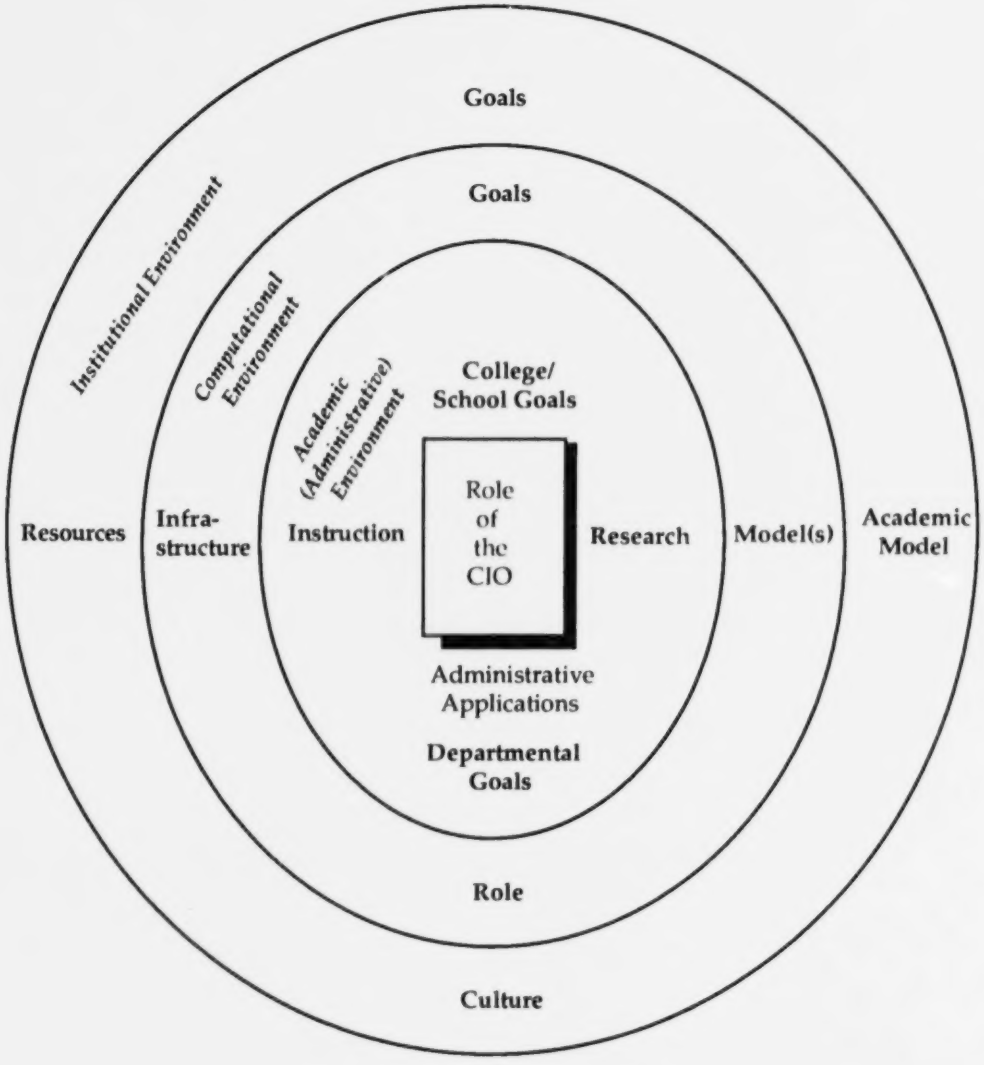
[4] The EDUTECH Report 4, "Chief Information Officers: New and Continuing Issues-Part 2," (July 1988).

[5] Adapted from "One Dean's View of Leadership Characteristics in a High Quality Professional School," Donald A. Marchand, Dean, School of Information Studies, Syracuse University.

administrative. The objectives in this planning phase are (1) to refine the computing environment, by filling-in, embellishing, and replacing components of the infrastructure, and (2) to establish boundary relationships integrating these goals, roles, and environments to produce the sought after linkages.

Figure II

Framework for Making Strategic Linkages



Integration of Goals, Roles and Environments

Planning takes on new characteristics; it is intense, continuous, proactive, and operates on several levels simultaneously. There is less control and predictability in the outcomes. More parties are regularly involved in goal setting and evaluation. Not only is the direct participation of the CIO instrumental to the successful outcome of the planning process, but other institutional officers, the

Vice Chancellor for Academic Affairs, Vice President for Research and Graduate Studies, and the Vice President for Undergraduate Studies, for example, also begin to play important roles in setting priorities. Like the amoeba, these computing plans gradually and subtly change shape; they often multiply into a series of smaller, unit plans.

This new phase requires the ability to discern, and to navigate through, the complex web of interrelationships that exist within the cultural context of an academic institution. There are no maps to follow along the path to making the academic linkages sought as a consequence of enormous expenditures for infrastructure. Each environment will have its own route. At best one may find directional hints from the conceptual models developed by those who have begun to explore this new leadership territory.

"Making it All Fit"

The second, transitional, stage of the computing strategy that follows from the strategic relationships shown in Figure I spawns action steps that strive to link the computing model to the academic (administrative) model within the culture of the institution: its values, vision, its mode of interaction; the way it does things.

The academic model at Syracuse University is characterized by its academic signature:

> "Syracuse University is...comprised of a relatively decentralized organization of schools, colleges, and academic support units...committed to a cooperative and interdisciplinary style and character. We are more nearly a rapidly developing than a *status quo* university...aspiring to numerous salient features of eminence. Our approach...stresses the balance and synergism between undergraduate and graduate/research programs. We seek to develop as a special signature 'Liberal and Professional Undergraduate Education Mutually Reinforcing.'...The cooperative [and interdisciplinary] mode intrinsic to our model...[suggests] widespread participation, allowing all academic units to buy into the program...with resources allocated on the criteria of quality, centrality, and demand.... We support each other and create new activities at our boundaries rather than act in isolation...[to] achieve this goal of balance and mutual reinforcement.[6]

The action steps for making strategic linkages derive from that signature.

Action Steps: Establish the linkage between the University's computing model and the academic goals of the University.

> Link computing programs and facilities to the academic signature of the University.

Establish the linkage between high quality administrative systems and the academic goals of the University.

> Promote the management of information as a resource by providing software, equipment, and services to encourage the penetration of end-user computing throughout the client areas.

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[6] Gershon Vincow, "Academic Goals of Syracuse University Through 1995," Syracuse Record, 17 October 1988, pp. 6-7.

Allocate resources strategically.

> Differentially allocate computing resources to reinforce the growth and renewal of academic programs in accordance with academic priorities, based on the criteria of quality, centrality, and demand, linking specific initiatives to specific outcomes.

Figure III shows the actual linkages between the elements of the University's academic signature and its computing facilities and programs. Since the University chooses to strive for a balanced approach to academic development, the computational resources provided must also be balanced in focus and furnished at a uniformly high quality level. Similarly, service and program offerings must reinforce the cooperative and interdisciplinary style and character of the University. For example, public clusters and specialized facilities, such as the graphics and design clusters and advanced computing support services, have a mandate to bring together people from different disciplines with similar interests. Distributed computing facilities, supported and unified by a strong core of centrally provided services, serve the heterogeneous collection of schools and colleges. Furthermore, numerous formal and informal committees and discussion groups supply opportunities for the larger academic community to provide guidance in setting the strategic and tactical goals for computing and its constituent units.

Figure III

Syracuse University Computing Strategy

LINKAGES	
Academic Signature	**Computing Programs and Facilities**
Balanced Approach Instruction and Research Liberal and Professional Undergraduate and Graduate	***Balanced Approach*** Faculty Assistance and Computing Education Services (FACES) Instructional Computing Services Research Computing Services Workstation Integration and Support Program (WISP) Student Facilities
Cooperative and Interdisciplinary Style and Character	Advanced Computing Support Services (ACSS) Joint Planning Program Graphics and Design Clusters Software Management Committee
Decentralized schools, colleges, and academic support units	Faculty Liaison Program Academic Computing Planning Committee Publications Program Distributed Facilities with Strong Central Support
Rapidly developing, not *status quo*	Progressive computing environment
Bootstrapping and Mutual Reinforcement	Resource allocation based on academic priorities
Aspire to eminence	Aspire to eminence

The University is in transition, owing to its decision to enter a phase of rapid development. For computing to exercise its defined role in that development the computational environment must be a progressive one. Similarly, the allocation of computational resources must be directly connected to academic priorities. Finally, since the academic and computing models are so strategically related, they must take parallel routes to eminence. The models for academic and administrative computing further support these connections.

Model for Academic Computing

- Progressive computing environment
- Rich, varied, and robust infrastructure
- Access to on- and off-campus resources
- Distributed facilities with a strong core of central support
- Aggressive deployment programs reaching beyond the nucleus of traditional users
- Aggressive support programs
- Seeking opportunities to play a leading role in selected areas
- Penetration into instruction and research through joint planning
- Monitoring of quality and productivity of use of computational resources
- Management of information as a resource
- Emphasis on communication (networks, publications, interpersonal)
- Continuous evaluation of programs and facilities
- Internal and external visibility

Coupled with a rejection of the *status quo* on the academic side is a long tradition of strong, sophisticated administrative support systems. The University is, thus, positioned so that a period of heavy emphasis on academic computing is feasible and both politically and fiscally acceptable.

Academic computing may be in the limelight but administrative computing is not mired in the *status quo*. The administrative model represents a shift of emphasis, away from data processing, toward the management of information as a resource. This change in direction has been accomplished by reallocating existing staff and budgets from traditional applications development groups to the support of two units that provide services to drive the institution in this new direction. This new thrust results in direct benefits, in the form of better and more readily available information, to the academic units.

Model for Administrative Computing

- All major business systems automated and online
- Use of fourth generation productivity tools and techniques to develop integrated systems more quickly
- Organized to balance cost containment against applications advancements

- Moving away from data processing toward information resource management.
- Organized to emphasize the importance of data administration and end-user computing to information resources management
- End-user modules built into new applications
- Use of electronic mail to achieve administrative goals through quick and efficient communications
- Administrative Computing Advisory Group provides guidance in setting policies and priorities

Both computing models are resource intensive to maintain and to promote. Consequently, to retain credibility with the institution's fiscal watchdogs, the CIO must make intelligent investments that are directly tied to the institution's academic (administrative) model.

Tactical Processes

The processes, associated with the allocation of computational resources, serve to form the sought after linkages between computing and academic goals and priorities. The tactical approach is to pursue the general goal of deploying the technology across all academic units with attention to both research and instructional requirements and a concern for achieving a measure of equity for the traditionally "have not" units. The sequence in which computing needs are addressed is determined in accordance with the overall priorities of Academic Affairs. The priorities of Academic Affairs are geared toward academic development and are articulated in terms of alternatives by discipline or unit: growth, renewal, or *status quo*. A joint planning and evaluation endeavor underway with selected academic units, in conjunction with the deployment of equipment, ensures that the technology is used productively and that its utilization penetrates the disciplines more rapidly.

In a period of rapid transition factions will form and rifts will arise between them unless, the entire institution understands the strategic relationships inherent in the attainment of its goals. As the institution becomes more selective in its equipment acquisitions, both purchases and gifts, the technical opportunities, much to the dismay of some vendors and academic administrators, do not always match academic goals. Concerns of risk and uncertainty shift from technical decisions to making a harmonious match between technological opportunity and an institutional requirement articulated within the academic priority structure. Sensitivity, awareness, diplomacy and care now become essential components of the CIO's leadership style. Far more consultation is required. Success is no longer found in the installation of a product; instead, it resides in the productivity of the clients and the quality of their work. As Erich Bloch, Director of the National Science Foundation said in his address at the recent EDUCOM Conference, "Technology makes things possible; people make things happen."[7] To become the orchestrator of the delicate interconnections inherent in this computing strategy, the new era CIO needs to add to the charismatic leadership

[7] Erich Bloch, "The Strategic Importance of Education for Competitiveness," EDUCOM (Washington, D.C., 27 October 1988).

qualities that are taken for granted, the integrating attributes, shown in Figure IV, that are essential to a progressive computing environment.[8]

Figure IV

Characteristics of Leadership in a Progressive Computing Environment	
Charismatic Role •Strategic and Decisive •Visionary •Change Oriented Risk Taker •Entrepreneurial	*Integrating Role* •Oriented to Constituency Management •Empowering •Attentive •Collaborative •Communicates vision internally and externally •Realistic •Interdisciplinary View •Bridges academic and professional worlds

This computing model further requires that the staff, particularly those at the middle management levels, understand and practice the art of communication among themselves and with their clients; it requires the CIO to engage with the organization. The challenge to the CIO is to muster the sensitivity and patience to negotiate strategic academic alliances, to attend to the organization, and to adopt the type of management philosophy described so well by Peter Drucker in a recent *Harvard Business Review* article:

> "Every enterprise requires simple, clear, and unifying objectives. Its mission has to be clear enough and big enough to provide a common vision. The goals that embody it have to be clear, public, and often reaffirmed...[the culture of an organization] is the commitment throughout the enterprise to some common objectives and common values...and goals. ...[the enterprise] must be built on communication and on individual responsibility."[9]

Once the integrating characteristics of the leadership role assume ascendancy, the expectation is that the application of these principles of management will produce, as Drucker suggests, an organization with the capacity to achieve more with greater vision.[10]

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[8] Adapted from Marchand, Characteristics of Deans.

[9] Peter F. Drucker, "Management and the World's Work," Harvard Business Review, no.5 (September-October 1988):76.

[10] Ibid.

'PARTNERSHIPS' ARE THE FOCUS OF THIS INFORMATION SYSTEMS PLAN

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ABSTRACT

Planning for Information Systems (IS) is a critical institutional activity, yet it tends to be maligned and misunderstood. IS planning is an essential 'enabling process' to position an institution to take advantage of opportunities and to exploit strengths. A technology-oriented vision, coupled with executive support is essential. IS plans should focus first on effectiveness rather than efficiency. Because computing and communications are so pervasive, IS planning at the University of Kentucky has sought to identify an institutional direction and commitment. Substantial resources will be necessary to achieve this plan; cooperation and partnerships (both internal and external) are of central importance.

An Overview of Information Systems Planning

In 1978, Steven Mueller (President of the Johns Hopkins University) spoke with clarity on the dramatic impact of the transition from the "go go" decade of the sixties to the apparent stagnation of the seventies upon higher education in the U.S. In Daedalus, he lamented "We are not where we were in American Higher Education." His message seems apropos to the technology professionals in higher education today for, if the decade of the 70's was the era of large central computing facilities, surely the decade of the 80's has been the decade of the departmental and the personal computer. We are not where we were. Decentralized, distributed, dispersed--by whatever term, we have shifted from the mainframe as the sole source of computing services, to the mainframe as one of many servers of computing resources in an increasingly homogeneous environment. The 'good-ol-days' when a central computing center had it all and could plan, manage and control it all are gone (and most of us would say, thank goodness!)

Because of this transformation Information Systems (IS) planning has become both more important, and more difficult. Not only has the technology proliferated, but so have the decision makers and the options. Diversity and uncertainty have replaced singularity and predictability as institutions try to plan for technology. Planners and decision makers are caught between the increasing economic affordability of discrete components of technology and the escalating total institutional investment in technology. It is increasingly apparent that technology investments must be viewed within the context of institutional strategic planning.

Information systems are horizontally oriented to offer services to a broad array of vertically aligned departments and divisions. Therefore, it is absolutely essential that a strong link be established between institutional strategic planning and information systems strategic planning. The former must precede the latter; information systems can offer a vehicle to achieve institutional strategic objectives but should not themselves become strategic objectives. In the final decade of the 20th century, the long term strategic value of information technology investments will have a profound impact upon our institutions. Strategic planning for information systems technology therefore becomes a critical responsibility for us all.

Strategic planning has become a much abused, and maligned concept in recent years. There seems to be countless seminars, workshops, conferences, monographs, and books, not to mention consultants, addressing this topic. IS strategic planning is an important institutional activity; its significance should be recognized throughout the organization. IS strategic planning positions an institution to respond to windows of opportunity, to capitalize on the unexpected, and to respond to pure chance. Information systems (IS) planning becomes an enabling process to benefit the entire organization. IS strategic planning should offer a vision of a new order, of

new processes and ways of doing things. An IS plan helps to define the vision; if an institution does not begin with a defined vision of where it is going (a strategic plan), it is difficult to judge whether the institution has achieved its goals. Without a vision institutions cannot and should not expect great results; an institution may realize discrete and isolated random benefits but broad, strategic benefits will seldom be realized. IS planning demands a technology-driven vision premised upon an understanding of institutional goals. A technology-driven vision is essential to recognize the potential technology offers and to make the necessary investments to reap the benefits. IS planning should hold out the promise of significant improvements over today's reality. Successful IS planning should culminate in the formation of an institutional strategic asset--the technology infrastructure to support broad institutional goals.

Leadership at executive levels is absolutely essential and is a prerequisite to successful IS planning. This executive involvement and interest must be ongoing. To sustain their interest, decision makers must understand technology; administrators who are unaware of the role and potential of technology cannot take advantage of it in their daily professional lives and consequently will be unlikely to champion its cause in resource allocation decisions.

Planning for IS is difficult; not only are the expenses high but so are the ambiguities and uncertainties. Many managers are effective at managing and understanding smaller, single-focused investments/projects which have correspondingly smaller benefits and returns on investments. But few are as successful at understanding and managing something as large and diffused as investments in information technology. Understanding, planning, and managing information technology means shifting from regarding IS as an expense, or a cost, and instead as an asset. It means shifting perspectives and expectations from a short term to a long term horizon. And finally, it means shifting from local, operational-level thinking, to organizational, strategic-level thinking. Strategic IS plans must focus on support for the larger issues confronting an institution, and thus should reflect the thinking of decision makers who understand broader institutional issues.

The IS planning process should be tempered with reason and understanding; it should not become an intimidating process. One of the keys to successful IS planning is to accept the inevitability of change and to establish reasonable and achievable goals. The historian, Henry Steele Commager, has observed that "change does not always assure progress, but progress implacably requires change." Technological change is inescapable; IS planning goals must balance technological opportunities with institutional realities. If planning goals are unreasonable so likely will be the results; if unrealistic, then the effort is likely doomed to failure. Effectiveness and efficiency are other concepts which are often touted, but which should be qualified in the context of IS planning. An IS plan should focus on

effectiveness, rather than on efficiency. Efficiency is a cost-oriented concept, while effectiveness is a results-oriented concept. Peter Drucker once observed that "there is nothing quite so useless as doing with great efficiency that which should not be done at all." Put another way, efficiency is doing things right while effectiveness is doing the right things. An IS plan must first be effective in its support for institutional goals; its efficiency can subsequently be judged in the context of operational realities.

Information Systems Planning At The University of Kentucky

Computing at the University of Kentucky (UK) has grown from modest beginnings in 1958. Today, the University of Kentucky operates sophisticated and technically state-of-the-art computing and communications facilities. Computing and communications have become interwoven within the daily activities of teaching, research, and service occurring in hundreds of departments and physical locations of the University. The University of Kentucky is the statewide land grant and research institution for the Commonwealth of Kentucky; technology enables UK to reach not only its local community of interest but to embrace a national constituency with international extensions.

Technological decisions are dependent upon market choices available at a given time; there likely will always be a "better" product or service forthcoming. To wait for the next "latest and greatest" can render the consumer helpless. The University cannot afford to wait for the "best" product or service which may (or may not) be available despite marketing hype. Technological decisions are temporal and must be based on both an assessment of known and anticipated needs as well as on available products and services. UK's strategy is less an architectural blueprint and more an evolutionary prospectus for interweaving technological innovation with institutional evolution. Technology becomes the means, not the end, and emerges as the indispensable partner which empowers the University to take advantage of windows of opportunity in its quest for excellence.

Computing and communications strategies provide essential support to educational policies and curricular needs (not vice versa). UK is committed to integrating and utilizing technology whenever possible to facilitate the learning process, to sustain and enhance leading edge research activities, and to manage scarce resources in the most effective manner. The University seeks to encourage and nurture a functional as well as a conceptual level of "technological fluency" to enable its community to understand the power of information technologies while developing individual facility to utilize these various technologies in support of personal and professional requirements. UK's plan recognizes that information technology can materially improve the quantity and quality of research opportunities, can enrich and strengthen instructional and learning opportunities, and can measurably improve both the capabilities and cost effectiveness of administration and management

activities. Technology can significantly contribute to the processes of learning and can catapult areas of specialization into recognized spheres of influence and expertise.

Because computing and communications had become so pervasive throughout the institution, a statement of institutional directions and objectives was required. The resulting strategy outlined a prospectus for the continuing evolution of information systems (both computing and communications) at the University, with emphasis upon broad goals rather than narrowly proscribed objectives. The University has, and will continue to support, a pluralistic approach to address the broad range of computing and communications needs. While individuals and departments retain the flexibility to determine their own individual requirements, it was incumbent upon the University to define broad, generic directions and to provide the appropriate support services to interface diverse local facilities to institution-wide information services and facilities. UK's plan attempted to outline these broad generic directions within a framework which could assist departments and individuals in making local decisions. With a clearer understanding of institutional directions and commitments, individuals and department could more effectively evaluate alternatives to best address their local needs.

Technology has made rapid and dramatic advances in the last decade; the pace continues to accelerate. Fueled by popular press reports of the promises of technology's potential and by rising levels of computing literacy, information users throughout the University evidenced an increasingly sophisticated and insatiable demand for computing and communication services and resources. The directions outlined in the plan were premised upon support for institutional, operational, and strategic objectives and not upon the glamour that technology promises. As an institution "WHY" questions had to be addressed first, otherwise the allure of the "HOW" and the politics of the "WHO" questions would delay and confuse the process.

Central to developing UK's strategic plan was the definition of a vision - what potentially might be rather than the repetition of what has been; not technology for technology's sake but technology to sustain the University and to expand its broader missions of teaching, research, and service. Sophisticated information systems will position the University to anticipate and reach out to new opportunities in its environment.

UK's plan was not a forecast of what will be. Strategic plans for information systems are not precise, predictive forecasts. Instead, the plan offered a strategy for anticipating changing needs and for taking advantage of rapidly changing technological opportunities. IS strategic plans should be both analytical and judgmental, based upon sound analytical techniques and collective thought

processes to commit resources in support of institutional priorities. The plan was the synthesis of thought, analysis, imagination, and judgment tempered with healthy skepticism. This strategic plan did not seek to make decisions in the future but, instead, to anticipate the future consequences of decisions made today. As such, the plan was not a detailed blueprint for construction, but rather a broadly-defined outline upon which future specifics could be detailed and incorporated into the biennial planning and budgeting process in support of evolving institutional goals.

Assumptions Underlying The Systems Plan

Information systems, of necessity, are heavily influenced by the availability of technology. Information systems, much as physical facilities, evolve in response to and in support of larger institutional goals. An effective information systems strategy, therefore, must balance technology opportunities with how the institution views itself and how it chooses to conduct its affairs.

Some basic assumptions about information and technology were required to provide the foundation for UK's plan. These assumptions included:

- Pluralism of local/native computing environments will continue and likely accelerate. Diverse communities of interest demanding specialized computing environments will continue to emerge.

- The University has a major investment in decentralized, multi-vendor computing resources. This investment will continue to be encouraged and supported; however, compatibility and consistency with institutional objectives will be encouraged.

- Communications (multi-media, including voice, data, and video) technology is rapidly expanding in both complexity and in required resources. Functionally rich communications facilities are essential to support the complex information manipulation requirements of the University.

- Advances in technology will continue to drive prices down while escalating performance and power capabilities. This phenomenon is perhaps most evident at the desktop level. This trend shows no sign of abating.

- Resource demands will continue to outpace resource availability, which will necessitate careful planning and prioritizing of information services and facilities.

- Adoption, albeit gradually, of national and international standards and models within the industry will continue. The University will increasingly turn to

products and applications which utilize standards (OSI, ANSI, CCITT, etc.) and models as the only hope for real connectivity and compatibility.

- Large-scale, general purpose computing resources, centrally located and broadly accessible, will continue to be the cornerstone of the University's computing strategy. Similarly, the University will provide central, numeric-intensive computing services capable of supporting advanced scientific research across an array of disciplines.

- Integration of the most commonly used, multi-vendor based office automation and personal services support packages will be accomplished. Integrated office support services based on commonly defined, generic industry standards should be available including the ability to transfer and edit text, to send mail and messages, and to share data files, spread sheets, and graphic output. This comprehensive office support environment will be further strengthened by the availability of local electronic maintenance/repair facilities offering favorable rates, by common training facilities, by favorable site licenses for software, and by emergence of a commonly trained pool of support staff.

Partnerships Are Essential To Achieve The Strategy

Computing and communications technologies are too pervasive and too expensive to realistically propose they be funded or supported from one (central) source. Institution-level resources are not adequate to support all levels of need and are probably not appropriate for all levels anyway. Just as in the past, financial support for local computing and communications will remain diffused throughout the organization. Experience suggests that those closest to using the facilities can make the best budgetary prioritization and allocation decisions (at least in the opinion of the users). Complementing this observation, however, was the recognition of the institutional nature of computing and communications, and, therefore, of the need for an institution-level plan and an institution-level financial commitment. Today's teaching and learning activities are heavily influenced by the infusion of technology; clearly an institutional financial commitment was needed. This institution-level commitment necessitates a partnership of central and distributed resources along with central and departmental leadership to insure success.

Technology is not inexpensive; to sustain the University's commitment to encourage technology in all facets of learning and research requires significant and ongoing infusions of recurring and non-recurring dollars. Funding and allocation strategies related to technology must be consistent with and supportive of this institutional commitment.

To realize the potential which technology promises, an architectural outline or

infrastructure to support the continuous evolution of technology across the University had to be established. This infrastructure consisted of a definition of services and associated responsibilities, an organizational outline, and associated resource allocation strategies. A decentralized approach to establishing this infrastructure was neither practical nor reasonable; nor was a decentralized approach to funding it. And, perhaps, most importantly, a decentralized funding approach was unlikely to result in the University achieving broader institutional goals. An institution-level commitment of resources was the necessary precursor to exploiting the potential of information technology.

Prior to the current fiscal year, recurring institutional commitment in support of University-wide computing and communications had remained relatively constant (on a real dollar basis), and as a percentage of institution budget, it had actually declined. Concurrently, expenditures at the local and department/division level had risen dramatically. This contradictory support pattern resulted in a fragmented, decentralized, and disproportionate distribution of technology across the institution. To redress these imbalances and inequities, and to insure that institutional objectives were adequately supported, an institution-level commitment of resources was required.

Additional expenditures of several millions of dollars in each of the next several years was necessary to achieve even limited objectives. Clearly, new directions and initiatives were necessary to keep pace with technological opportunities while recognizing economic realities. The University budget was strained; major infusions of additional state funds are unlikely in the next several years. Capacity within present budgetary formulas and allocation schemes to support even modest evolutionary growth, let alone explosive and revolutionary expansion of technology, were extremely limited.

Where, then, should the responsibility lie for funding this institutional commitment to technology?

Financing is arguably the most difficult aspect of defining and implementing an institutional strategy for technology. The financing strategy must be recognizable, consistent, and equitable, with the objective to share the obligations essential to meet the commitments. A partnership must be forged across all organization levels and divisions (individual, departmental, sector, and central) to focus upon this strategic initiative. It is not appropriate to expect an institution-level office (i.e: the Information Systems Division) to become the locus for all funding activity. In practice, this central office will certainly influence the types and nature of local expenditures as an outgrowth of coordinating institutional strategies and directions, but should not be looked to as the source of funds. This office is the steward of the strategic architecture, rather than the central bank to provide capital resources.

The financing alternatives to achieve the plan are relatively straightforward: solicit new, additional funds, or reallocate current funds. If the financing strategy assumes that relatively flat budget growth over the next several years (in constant dollars) will occur, then questions of what current services to cut back or phase out, or what current users to reduce, or eliminate support to, will have to be addressed. If the financing strategy, however, assumes that significant new funds can be attracted (from various initiatives), then the financial impacts of this growth upon other areas of the University can be moderated.

As noted earlier, subtle but dramatic shifts in funding responsibilities for computing and communications have already occurred in recent years. At the personal computing level, increasing numbers of students and faculty have been purchasing their own equipment. Departments and divisions have also increasingly provided personal computers and/or workstations for their faculty and staff. Extramural funds (grants and donations) have materially contributed to the quantity and quality of computing equipment (particularly in laboratory settings). Departments and divisions have assumed the interconnect charges to link their computing facilities via the communications network to institutional resources and national networks. All of these expenditures have occurred with little commensurate shift in budget allocation to the local departments. While University-wide (institutional level) services continue to be funded centrally, departments and divisions have absorbed their portion of costs through reallocation of current funds, through fund balances, or through grants and donations. For many departments and divisions, providing computing and communications support has become a dominant budget item, superseded only by personnel-related costs.

A critical reexamination of funding and allocation strategies in support of institutional computing and communications objectives seems in order. It is neither realistic nor reasonable to assume that everyone will continue to do all they have done before, and support these activities to an adequate level, plus do more as the University moves forward with new initiatives in technology. The only rational conclusion is that significant new funding sources need to be developed at both local and institution levels. Partnerships emerge as the key to future success.

Various partnership opportunities exist. Externally focused partnerships in the following areas offer promise:

- joint undertakings with corporate partners in the computing and communications industry to develop products and/or services of local utility with broader market appeal;

- coordinated negotiations with regional and national foundations which share

particular areas of interest in developing innovative applications of technology in support of foundation commitments;

- state government through general fund allocations and state-supported bond issues;

- grant and corporate gift programs which capitalize on recognized areas of faculty research expertise.

- participation in regional and national consortia; and

- cooperative efforts with other higher education institutions.

Likewise, internally focused partnerships in a variety of areas are essential, including:

- joint activities with distributed computing facilities on campus to consolidate basic services such as printing, backup, and disaster recovery facilities;

- sharing the cost of acquiring software, especially for institution-wide site licenses;

- sharing personnel resources, ranging from joint faculty appointments in computing services areas, to sharing scarce technical support in critical areas such as operating systems and communications;

- sharing responsibility for funding both the availability of services as well as access to those services. i.e: central responsibility for providing the broad-based services with local responsibility for providing access; and

- sharing responsibility for and participation in the information systems planning process, such that both customers as well as providers of information system services share in defining the vision of the future.

Regardless of the internal or external focus of the partnerships, it is essential that all parties enter into the relationship as equals with recognized strengths. Each partner expects to gain from the relationship. In this view of a partnership, each participant enters into the relationship with a hand extended sideways (as in a handshake) representing respect, and an expectation to learn and to benefit. The alternative is for one participant to enter into the relationship with hand extended palm up, (as in begging) representing inequality and an expectation of something for nothing. This relationship is not really a partnership at all, but more of a benefactor - supplicant

relationship. For the University of Kentucky, a partnership perspective based upon equality and respect is integral to the achievement of its Information Systems strategy.

After considering the economics and the expectations surrounding information systems at UK, it was apparent that new structures, techniques, and approaches were essential. If the University is to realize the potential of its commitment to information technology, the various partners in the process must be recognized. Partnerships will mean the difference between success and failure in this effort. Successful partnerships capitalize upon the strengths of each of the participants. The relationship builds upon strengths such that the whole is truly greater than the sum of each part. When each partner brings strength, each contributes to and shares in the success of the partnership. The successful partnership maintains a dynamic, rather than steady state view of the relationship of the participants and of the goals to be addressed. And in the process, each partner emerges as a winner.

Strategic Planning for Technology at the Wharton School: Facilitating Change

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Abstract:

To be effective, technology planning must be linked to the larger goals of the organization. This paper presents the technology planning process at the Wharton School: a seven-step program to evaluate technology issues in light of the goals embodied in the School's Plan for Preeminence. Sample cases are presented illustrating how this process has been applied to two major technology problems: providing consistent hardware growth plans adaptable to changing demands, and developing an organizational model for research computing support.

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Strategic Planning for Technology at the Wharton School: Facilitating Change

INTRODUCTION

As professionals in the field of information technology we have experienced dramatic changes in our industry over the past five years. Obviously, these changes have been directly influenced by the rapid and seemingly endless pace of technological development. This technological "revolution," however, can best be characterized as a double-edged sword for most technology professionals. While it is clearly exciting and rewarding, it also presents many difficulties. Just a short time ago many of us would have characterized ourselves as change agents in our respective educational institutions, preaching the gospel of technological innovation to our constituencies. Today, if we are not careful, we may become the victims of the change we have so ardently advocated.

With the previous concern in mind, it is our position that the technology professional today, and for the foreseeable future, must become an effective manager of change. We believe that successful change management requires an ongoing, structured, and focused technology planning program grounded in a clearly defined and articulated set of institutional goals.

Our experience suggests that effective computing planning cannot succeed in the absence of a clear and well-publicized institutional strategy. In our opinion, planning for technology in the absence of an institutional strategy almost guarantees that one will be victimized by change.

This paper will examine the ways in which institutional strategy and computing strategy can be linked in order to ensure that the technological infrastructure adequately responds to the needs and goals of the organization. Although we believe strongly that a formal institutional strategy is the key element in effective computing planning, it is by no means a guarantee of success. While the linkage to the institutional plan is crucial, the technology planning process must also follow a well-defined path with a clear set of objectives.

BACKGROUND

The Wharton School of the University of Pennsylvania is one of the premier business schools in the world. Wharton enrolls over 5,100 students in degree-granting programs: approximately 1600 MBA and 400 Ph.D. candidates, 3000 undergraduate and evening-school students, and 175 participants in the executive MBA program. The standing faculty numbers approximately 180, supported by an administrative staff of 360. The School also serves some 5000 middle- and senior-level managers each year in its various Executive Education programs.

As with most institutions of higher education, computing has become an integral part of the mission and operation of the school. From research supported by large systems to LOTUS 1-2-3 class exercises on personal computers, the applications are as diverse as the faculty and students that generate them.

Academic computing at the University of Pennsylvania has historically been decentralized, with primary support provided at the school level. As a result, the Wharton School developed its own internal academic computing center—Wharton Computing and Instructional Technology (WCIT)—during the early seventies. In response to its growing research and instructional needs, in the mid-seventies the School purchased a DEC 10 to meet the demand for both student and faculty computing. The nature of the environment provided by WCIT remained essentially unchanged from this period until late 1983. As the need to expand several areas of research and instructional computing became evident, particularly in the area of integration of personal computers, the responsibilities of the computer center began to change rapidly.

THE PLAN FOR PREEMINENCE

When Russell E. Palmer became Dean of the Wharton School in 1983, he recognized the emerging role of computer technology and the strategic importance of this technology for business education and research. Improved computing hardware and support were key elements in his vision for the Wharton School, and received major emphasis. Of even greater importance to the School, however, is the Dean's commitment to strategic planning to achieve a collective vision for the long-term future of Wharton.

During his first year at Wharton, the Dean instituted a planning process with a five-year horizon that encompasses all entities of the school. Entitled the "Plan for

Preeminence," its aim is to "assure that the Wharton School is the finest school of management in the world." The plan detailed an approach to this mission that encompassed developing excellence in education, research, and life-long learning. Toward these ends, the Plan for Preeminence established ten school-wide strategic goals that became challenges to be met by all academic and administrative departments. The ten goals are as follows:

1. *Attract and Retain the Best Faculty.*
2. *Attract and Place the Best Students.*
3. *Do the Best Research.*
4. *Provide the Best Education.*
5. *Build on Excellence; Develop and Upgrade Selected Areas; Consolidate, Eliminate, or Maintain Selected Areas; Work Toward Our Collective Vision.*
6. *Have Effective Internal University Relations Conducive to the Achievement of the University's and Wharton's Goals.*
7. *Have the Best Image Portraying Our Accomplishments.*
8. *Have Excellent Facilities.*
9. *Have Necessary Resources.*
10. *Foster an Attitude of Working Together to Achieve Our Collective Goals and Long Term Mission.*

After five years, these goals have become institutionalized measures of the success that the School is experiencing in its overall efforts. As part of this "living" planning process each academic and administrative department develops its unique contribution to the plan during an annual update. Each month, departments submit measures of critical activities which contribute to, or detract from, goal achievement. These monthly updates are then consolidated into a management briefing book that is reviewed quarterly by Wharton senior management. At the beginning of each new plan year the process requires that a summary of the previous year's accomplishments be prepared with a specific review of the key actions cited for accomplishment that year. Although the academic environment frequently does not embrace careful planning, Wharton's system has received strong support throughout the School.

Planning for technology at Wharton is greatly facilitated by the Plan for Preeminence. Rather than guessing at the appropriateness of a technology or service, WCIT has developed a planning process that can be applied uniformly to each topic under consideration.

The first step during each annual planning cycle is to review the school-wide goals in light of outstanding computing needs. We then review these issues looking for common threads, and, ultimately, develop a list of areas to prioritize and address.

To illustrate the outcome of this process an example has been extracted in its entirety from the WCIT 1988/89 Annual Plan Update (Figure 1). This example outlines WCIT's response for fiscal 1988/89 to the fourth goal of the Plan for Preeminence, "Provide the Best Education."

As can be seen by this example, WCIT has identified a set of specific activities that respond to the goal in question. The second, and equally important, step in the process is the actual planning to determine the specific programs and projects to achieve the stated objectives. In the next section we will outline this process and the philosophy that underlies it.

OUR PHILOSOPHY

Our basic strategy is to create a system and an organization that are adept at managing change. The goal of our strategy is to allow for modification of all parts of the system with low incremental cost to the organization. In many ways the strategy precludes any definition of a final hardware/software/network/service solution. It does, however, provide the organization with the ability to rapidly exploit changes in technology or demand. We believe this approach is consistent with the state and evolution of the industry today. We evaluate all offerings on their ability to permit addition or migration of function at minimal incremental cost and service disruption.

Are we succeeding? We think so. If we are to continue to succeed, however, it will not be because we have the best technological strategy, but rather because our solutions respond directly to the goals and changing needs of the institution.

OUR PLANNING PROCESS—THE MODEL

The planning process we have adopted requires that every specific technology issue first be evaluated in light of its link to school goals. At a later step in the process, the issue will be reviewed again, relative to the institution's goals, once alternatives have been evaluated and a solution identified. These steps ensure that only the highest priority areas are considered as the annual plan evolves.

GOAL 4: Provide the Best Education

Subgoals:

1. Provide appropriate tools and services for courses.
2. Teach the use of information technology and understanding of functions.
3. Promote alignment of the information technology used in the curriculum with the requirements and environments of the business world.
4. Provide support for, and coordination of, faculty courseware development.

Factors Inhibiting Achievement of Goals:

1. Cost of supporting broad range of hardware and software.
2. Insufficient availability of presentation-quality output devices.
3. Lack of suitable local area network services for student computing.
4. Degree of knowledge and skill required of users to maintain and access large databases.

Alternatives/Courses of Action to Achieve Goals:

1. Provide support staff with better training and sensitivity to student needs.
2. Coordinate closely with faculty on assignments to be certain that the students are properly prepared and the assignments are properly tested.
3. Develop additional shortcourses targeted to the requirements of MBA and PHD students.
4. Enhance online documentation and services description.
5. Enhance laboratory network services.
6. Provide lab laser printing services.
7. Install alternative prototype integrated teaching stations in classrooms.
8. Launch electronic publication support program.

***FIGURE 1**: Extract from WCIT's 1988-89 Annual Plan: "Goal 4: Provide the Best Education"*

There are seven steps in this process:

- Define the issue
- Link to school-wide goals
- Identify and evaluate alternatives
- Prioritize and re-link to school goals
- Implement a pilot project
- Make a recommendation
- Market the solution

Define the Issue

Issue definition is based upon methodical study of the school-wide environment and the technological alternatives. The two primary components of this step are data collection and analysis.

Collect Data

The first step in each case has been to develop as thorough an understanding of the internal environment as possible. We generally attempt to conduct a census of all stakeholders and a complete inventory of resources. In some cases we use questionnaires. In other cases, such as development of a hardware plan, we conduct focused group interviews with all interested faculty, department by department.

Analyze Data

Analysis of the data often presents a set of ordered functional priorities which are sometimes at odds with the functional attributes of the technological alternatives. Our job is to wrestle with these incompatibilities. The goal is to develop a list of concerns that need to be investigated under field conditions. These concerns detail the functional requirements necessary to achieve success.

Link to School-wide Goals

More often than not, strategic issues are disguised as operational problems. The biggest mistake we can make is to solve today's problem with a solution that subverts long range strategy. We are better off implementing solutions which are less than optimal for the problem at hand yet move us another step in the direction we want to go. The exercise of linking an issue to the school-wide goals forces a focus on the long term, and generally clarifies the significance of the issue to the organization.

Identify and Evaluate Alternatives

Our key criteria in evaluating alternatives include:

- fit with existing infrastructure,
- compatibility with standards (especially interfaces), and
- strategic relationships with the vendors.

Prioritize and Re-link to School Goals

It is easy to become so enmeshed in the planning process that the planning team loses sight of the strategic goals of the school. As the issue and its alternative solutions come into focus, it is important to reconsider its place in the big picture. This often suggests a reordering of the emerging issues and their priorities. The result of this activity is a statement of strategy rather than a plan for action. The principal components of the strategy are a suggested solution and the criteria against which to measure its goodness of fit.

Implement a Pilot Project

The purpose of a pilot project is not simply to see if the proposed solution works. Its purpose is to gain an understanding of the total impact of the proposed solution on the organization. How well will it fit and interact with the installed base? What is the cost, time, and effort required to install, maintain, and migrate the solution? What are the true impacts on the job for which it was targeted? How successful is it at achieving the strategic objectives?

Make the Recommendation

Once the management team agrees that the strategy is feasible, the recommendation process begins. The proposed solution must address policy, cost, and support issues.

Policy

No issue is so completely technical that it does not significantly affect the way the organization carries out its work. The pilot project is designed to uncover policy issues which must be addressed prior to implementation. For example, any hardware or software strategy must address the individual user's costs of migration, while a staffing strategy must address potential conflicts with university personnel policies.

Costs

Central to the culture of the Wharton School is the location of a great deal of responsibility and authority at the departmental level. Department heads are responsible for executing the strategic plan and have a great deal of discretion as to how to allocate available resources to that end. The result of our process is often little more than a recommendation to the department heads as to how to

spend their money—but it is based on our experience and extensive research.

Support

As the departments begin implementing our recommended solution, our role shifts to providing support. Our recommendation document must include a description of the support role we envision.

Market the Solution

We have come to believe in the power of a comprehensive marketing effort. The recommendation does not sell itself. Our marketing efforts include special mailings, testimonials by pilot participants, and many presentations to groups of stakeholders.

SAMPLE CASES

This model is currently in place and has been used to address many technology issues at the Wharton School. To illustrate how this planning tool has been implemented we have selected two diverse issues which were addressed using the model. The first case outlines the process employed to select our multi-vendor large systems hardware platform, while the second addresses our concern for a creative solution to our academic research staff support needs.

These cases demonstrate that, once an organization has internalized the process of planning, the methodology is equally adept at addressing areas as diverse as hardware selection and organizational development. Said another way, when planning becomes an organizational state of mind within an institution, aligning the technology resource with institutional goals becomes second nature.

CASE 1: LARGE SYSTEM CAPACITY

Defining the Issue

Our task was to find a new capacity expansion strategy that would adapt to changing demands in a coherent, consistent way. Over the previous two years, despite two carefully planned increases in our large DEC systems capacity, user demand could not be met. As Figure 2 shows, each CPU increment had been almost immediately saturated by unexpected levels of latent demand from research faculty.

Data Collection

As a starting point, we collected and reviewed two years of system performance and capacity utilization statistics. We knew from our recent experience, however, that such historical data alone would not inform us about *future* needs. We therefore also undertook a systematic, intensive, direct survey of the faculty, with the goal of obtaining a comprehensive understanding of current and long-term needs of our end users. Department by department, we conducted group interviews with all interested faculty and key administrative staff. These proved to be excellent forums for discussing current and long-term computing needs and preferences.

Analysis

The interviews confirmed that the only certainty in our computing environment is its need to continually change. Traditional capacity planning had already proved futile in our environment, for three reasons. First, the inherent volatility of research demand is enormous. Individual faculty research projects can consume weeks of CPU time and are extremely cyclical, leading to severe peak loading. Furthermore, individual faculty members, even in a standing faculty of nearly 200, can materially affect the load. What if Dr. X, an expert in optimization theory, gets a new grant? What if Dr. Y, a leading analyst of patterns in stock market transactions, leaves the school? What if Professor Z from a competing research institution accepts the School's offer of a chair in Econometrics? An important factor in the explosive demand for Wharton's large system resources has been the shift among the faculty toward greater use of computing: nearly one-half of the School's current faculty has been recruited in the past five years, and the newer members have a greater propensity to use high technology in their teaching and research.

Second, in the administrative area, we had begun a series of office automation pilot efforts intended to take the entire organization toward the information age. We could not adequately project our administrative requirements based on these pilot projects, other than to state that the needs would be commensurate with penetration of the technology.

Third, traditional capacity planning methods could not account for the dynamic effects of changes being made in our environment. Future disk capacity, for example, would depend in part on the network services Wharton and the University were planning to provide. True network computing would include the ability to share files transparently and to utilize network procedures for data backup. Would this increase or decrease our large system disk demand? How would it affect departmental or workstation disk requirements? All we could be sure of is that requirements will change.

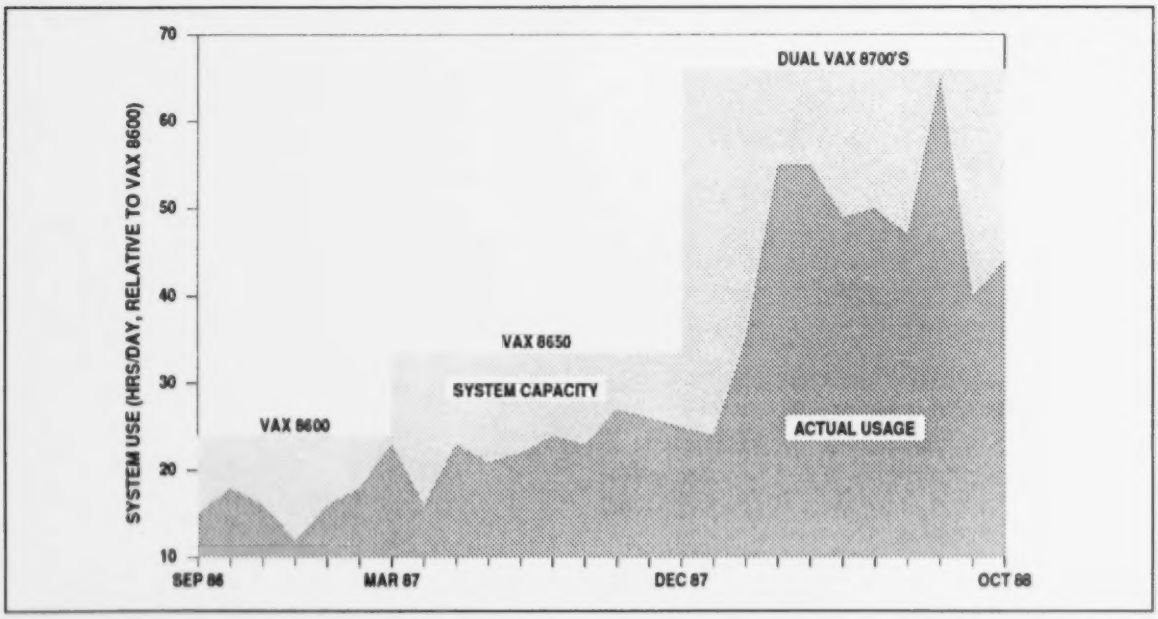

FIGURE 2: *PRIME TIME CPU USAGE*
Each CPU increase was almost immediately saturated by unexpected levels of latent demand.

Linking to School-wide Goals

The goal of becoming the world's preeminent school of business dictated the need for a world-class computer and information systems infrastructure. The large systems capacity strategy responded directly to Goals 1 through 5, 8, and 9 in the Plan for Preeminence.

Identifying and Evaluating Alternatives

Based on our analyses of the School's and the University's computing environments, our current large system needs and constraints, the faculty's expressed preferences, and probable costs, we decided that Digital Equipment Corporation and/or IBM were the vendors most able to respond to our needs for flexible capacity solutions. Our requirements were presented to them in a formal *Request for Information for a Computing Solution* (RFI).

From our technical review of their responses to the RFI, along with knowledge of IBM and DEC's respective product lines, we concluded that a single vendor solution would not meet our needs. It became clear that our central requirements were a standardized platform which would facilitate a range of alternative vendors' equipment, and an approach offering flexible, incremental enhancement. We recognized that networking, at the department, school, and university levels, was the key to this future flexibility to add and share resources.

Prioritizing and Re-linking to School Goals

A key objective of our strategic planning process was a more dynamic alignment of resources to demand. The growth in demand was in large part an indirect effect of several School-wide trends tied to the Plan for Preeminence—an aggressive faculty and student recruitment program (Goals 1 and 2), and specific emphasis on upgrading instruction and research quality (Goals 3 and 4). To respond to this steadily increasing demand, we needed to address more than an immediate question of what hardware to buy. We had to select a platform tied to a vision of where Wharton, and hence our organization, would be moving over the next several years.

Implementing the Pilot Project

Our recent experience in planned capacity increases provided, for us, a counter-implementation. In retrospect, it served as the first pilot we conducted in this particular planning process. Its lesson was that we needed a flexible technological platform on which we could carry out many "pilot" efforts, each addressed to specific capacity issues.

Having experienced first hand the dangers of estimating the generic performance specifications of a system,

we felt that we had to do everything possible to reduce the potential margin for error in determining the suitability of a particular configuration. Toward this end, a "typical" load was devised by assembling a representative sample of faculty programs. This suite of programs was run on each system under consideration by our senior systems programmer.

Although this process entailed significant time commitments, travel expenses, and vendor arm-twisting, the value of the effort was demonstrated in two significant ways. First, the ability to conduct side-by-side comparisons of the benchmarks raised the confidence level of the planning team in the multi-system solution. Second, and more importantly, the process raised the confidence of the School's management in the acquisition recommendation.

Making the Recommendation

A DEC VAX platform was selected to address our *horizontal* capacity needs at the central, departmental, and workstation levels. We recommended a VAXcluster comprised of two 8700s as the central component, nearly doubling our capacity over the single 8650. To complete this horizontal platform, we continued our conversion of the School's data communications system to Ethernet-based TCP/IP and Decnet, and completed interfaces to PennNet, the University's AT&T-supplied Integrated Services Network (ISN).

To augment that central horizontal resource, *vertical* capacity could be added in a number of ways. One type of vertical enhancement we recommended immediately was the addition of a Floating Point Systems M64/60 mini-supercomputer to the 8700 cluster, to provide high performance CPU capacity for compute-intensive VAX users. A second vertical enhancement recommendation was an IBM 9370 Model 90 computer, to provide a local IBM resource to support I/O intensive work and connectivity to the School of Arts and Sciences' IBM 3090 mainframe. This introduction of IBM hardware responded directly to specific faculty research needs for native IBM software, large CPU requirements, and facility in handling large datasets and research databases.

Beyond the IBM 9370 and the FPS M64, we envisioned future vertical-type additions, to support administrative and research needs as they develop over time. These would include, for example, the addition of DEC MicroVAX systems to the cluster, dedicated to particular applications or departmental groups.

Marketing

The marketing effort actually began prior to our final recommendation. We used departmental and School-wide meetings to inform our constituencies of the issues and potential solutions, and to gain the support of the faculty and senior management.

Once our recommendations for a combined Digital/IBM/FPS solution were determined, we used meetings and published documents to communicate them to senior management and the faculty. Announcements were placed in the School's newspaper, and in our own publications, including the semester announcement letter to faculty and our *Guide to Services*. In addition, we produced a special brochure mailed to all faculty and staff.

Now that the systems are in place, we have turned our marketing efforts to promoting the new capacity and helping selected users migrate to the FPS and 9370 systems. For these new systems, we have launched an outreach program to identify projects and specific faculty that would benefit from the FPS's power or the IBM's data-management capabilities. Training and individual support assistance is being directed toward these users.

Summary

The decision to provide a network-based Digital/IBM/FPS computing environment accomplished two important goals:

- it provided flexible large system research capabilities for faculty and students, and
- the strategy positioned Wharton in the computing forefront among the School's peer institutions, with excellent hardware and software from the industry's leading vendors.

Our chosen strategy has already proven to be a fortunate one. In the past two months, for example, we have added two Microvax 3600s and are now migrating administrative users from the academic VAX 8700 cluster to MicroVAX systems. In so doing, we have been able to provide capacity increments for expanding administrative needs, at the same time increasing the resources available to academic users.

CASE 2: RESEARCH COMPUTING SUPPORT

Defining the Issue

The primary objective of this plan was to recommend a course of action for enhanced research computing support for the School.

Data Collection

For this effort we reviewed data from other WCIT planning studies and conducted supplemental interviews with selected faculty and Department Chairs. We found that faculty desired additional software and dataset support, higher-level consulting and advisory services, and relief from clerical and low-level technical details related to computing. Department chairs and computing committees needed help in their technology planning, in managing their growing inventories of equipment and software, and most importantly, in recruiting and retaining technical support staff.

Analysis

Historically, Wharton's approach to research computing services was two-pronged—WCIT providing support for a common set of general tools, and departments having responsibility for their specialized local needs. These components rested on the two beliefs that, first, departments can best assess and prioritize their unique needs if given direct responsibility for them, and second, more widely shared requirements are more efficiently addressed through a common support organization. But the separation that evolved between intra-departmental support efforts and central services proved less than optimal.

Linking to School-wide Goals

The goal of the planning effort was to increase faculty research productivity through an improved range of services (Plan for Preeminence Goal 8), and thereby promote the School's ability to recruit and retain the best faculty (Goal 1), and to do the best research (Goal 3).

Identifying and Evaluating Alternatives

We considered three common models for organizing computing support services: the central academic computing center, the information center, and departmental computing.

- *Centralized academic computing:* the typical computer center provides services and systems for a wide population of users. Much of WCIT typifies this form.
- *Information center:* provides training, evaluation, and consultation to end users for a specific set of packages, typically microcomputer-oriented. WCIT also contains elements of the information center form.
- *Departmental computing:* computers and support personnel are located within the confines of the end-user department, and use is restricted to members of that department. Many Wharton academic departments have implemented some degree of departmental computing.

The staff associated with departmental computing is very similar to both that of the central computing and information center environments, except that there is typically more variability in the competence and quality of the departmental staff. There is usually also more turnover due to decentralized hiring and associated restrictions in career growth opportunities. It was evident to us that, due to the variety of faculty needs, departmental computing must continue to play a role in the delivery of research computing services. It was also clear, however, that improved mechanisms for ongoing communication between WCIT and departmental faculty would be essential for enhancement of research computing support.

We decided to modify our Research and Instructional Services unit, retaining a core of common support services provided by central staff, but deploying other consulting resources to academic departments. The innovative part of this design was the blending of the first model (central academic computing) with the third (departmental computing). The distributed component would consist of senior WCIT consultants who would be stationed in participating end-user departments under our continued management but with a joint funding arrangement with the departments.

Prioritizing and Re-linking to School Goals

There was little difficulty in confirming that this problem was high priority for it relates directly to three goals of the Plan for Preeminence and involves all four of WCIT's own Goal 1 subgoals, three of our five Goal 3 subgoals, and the second of our four Goal 9 subgoals.

Implementing Pilot Projects

Over the past six months, the distributed staffing component has been instituted in two academic departments (and three administrative offices). While the specific job descriptions and qualifications have been tailored to each case, five common elements define our basic implementation:

- Participation is voluntary. After an initial trial period, units commit to the remainder of the fiscal year, and on a fiscal year-to-year basis thereafter.
- Job descriptions are developed and candidates are selected jointly by WCIT and the participating departments.

- Distributed personnel physically reside in the user department office suite.
- WCIT holds regularly scheduled meetings, where attendance is required of distributed and central staff. These serve essential management and coordinative functions and expedite information sharing and diffusion of innovations among staff, and thereby, to clients as well.
- Under WCIT's general direction, distributed staff manage day-to-day allocation of efforts and resources. Overall prioritization of services, however, is determined by the department.

As the program expands, we expect some growing pains. More lead time will be required to recruit and train, because distributed staff need to be familiar with both the client office and WCIT itself. And span of control will become an issue as the program grows—we intend to address it with an internal promotion to management level at the appropriate time.

Making the Recommendation

We are recommending that the School adopt the distributed staffing plan for computing support, in both academic and administrative departments. The evaluation results demonstrate that the strategy meets key needs throughout the School: it is consistent with the organizational culture, and therefore is readily adopted—even demanded; it leads to higher productivity and lower total costs for participating departments and the School as a whole; and it contributes to key objectives of the Plan for Preeminence.

Marketing

In the pilot implementation stage, the program has not required any publicity or promotion—it markets itself through its own successes. To the extent that it meets the needs of participating departments and faculty, it builds its own demand within and across departments. Users and departments tell each other about the program, with the result that departments seek us out.

If the plan is formally accepted, we will market it cautiously, because too rapid expansion could jeopardize the quality of staffing and organization on which it is based.

Summary

So far in the preliminary implementation, all of our expectations and those of the participating departments and offices have been exceeded. In particular:

- More specialized support is being delivered to faculty,
- the flow of information to and from departments and faculty has improved,
- user requests are being expedited through the local consultant,
- local staff are benefiting from the professional development, backup, and continuity provided by our group, and
- turnover and attrition have been reduced among departmental technical staff.

CONCLUSION

One can select from a number of good planning methodologies to structure a technology planning effort. Our particular selection works for us. The important issue, in our opinion, is not which methodology is chosen, but that a choice is made.

The plan must be properly communicated, and this requires a written plan statement. Even the best-constructed plan will not achieve its goals unless it is conveyed effectively.

Finally, the critical success factor in planning efforts is the degree to which the plan explicitly, or implicitly, links to the institution's goals. Linkage to the institution's goals addresses two key elements for planning success: achieving "buy-in" by members of the organization to the plan, and properly focusing on the issues of greatest importance to the institution.